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20 JULY 1987

SCIENCE & TECHNOLOGY EUROPE & LATIN AMERICA

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FRENCH R&D IN SUPERCONDUCTORS REVIEWED

Paris LE MONDE in French 8 Apr 87 pp 17, 19

[Article by Jean-Francois Augereau: "Superconductors Outpace Research"; first paragraph is LE MONDE subheadline]

[Excerpts] Zero energy loss electric current-conducting metals. A revolution in solid state physics.

The French Are Catching Up

That is not a reason for researchers and French manufacturers to delay entering this sector where discoveries almost outpace the ability of specialized publications to report them. For the last 3 or 4 months laboratories around the world have been vying for leadership and the French will have to redouble their efforts to stay in the race. In fact, according to Jacques Friedel, former director of the Orsay Solid State Physics Laboratory, "interest in superconductivity has faded since the explosion in research we saw in the 1960's. In France, more so than elsewhere."

The heads of some laboratories, he says, "have abandoned their work and only the stubborn remain in this field." They are the ones who have worked since January to reduce the small lead taken by others. "We were 1 month behind," admits Mr Robert Tournier, of the CNRS [National Center for Scientific Research] Center for Very Low Temperature Research in Grenoble. "Not in the chemistry of these new superconducting compounds established at IBM's Zurich laboratories, but in observing them."

Today that is forgotten, and Mr Daniel Thoulouze, assistant scientific director at the CNRS, confirms that "the French are back in the race." Denis Jerome of the Orsay Solid State Physics Laboratory explains that this catching up is due to the fact that "these new materials made with lanthanum, barium, and copper oxides are easy to produce, as the process for making them is similar to that used in ceramics to produce enamels." It is also due to the fact that several of them were first synthesized in 1981 by two chemists, Claude Michel and Bernard Raveau, of the Crystallography and Materials Sciences Laboratory of the University of Caen. But at that time they were not able to demonstrate their superconductivity--their equipment did not permit

it. Georg Bednorz and Alex Muller of IBM Zurich happily did so when they observed the phenomenon in a material of this type at a temperature of between 10 and 30 Kelvins. A 30-year old record--23.3 Kelvins--was thus broken.

Today thousands of researchers are working in this field, as evidenced recently by a sort of "Physics Woodstock" in New York attended by more than 2,000 people. Under these conditions, records are broken every week and, every week, a new product is invented replacing lanthanum by yttrium, or barium by strontium, or yttrium by scandium. This type of alchemy is as common as the overhasty announcements made by some who are hungry for success. This distorts the question slightly, according to Bernard Chevalier, a Bordeaux researcher, who asks for "sorting out" of what is "real" from what are merely some people's "dreams".

Incentives

That is why the CNRS and the General Electricity Company (GEG) met last week to adopt a strategy. Even if progress is fast--laboratories in Caen, Grenoble, and Bordeaux have just patented several materials with lower performance but higher stability than the record-holders--much remains to be done. To begin with, the experiments of others need to be repeated to see if they have "covered the field." There is also a need to initiate specific research to identify new directions to be taken.

According to Daniel Thoulouze, "an effort must be made in France to work on a comprehensive scale in this field. In the first stages, it is not so much a matter of money as of encouraging people and coordination," perhaps as is done in Japan. It is also necessary for manufacturers to familiarize themselves with these new products which resemble ceramics, products which American and Japanese firms are in a good position to produce. Even though it is relatively easy to produce a sample or a monocrystal of these superconducting substances, it will be considerably more difficult to produce wires for computers and electrotechnology or thin films for electronic components at a reasonable cost. Especially if one of the chemical substances needed to make these superconductors requires a material as rare as scandium oxide.

25052

CSO: 3698/A209

FRENCH PRODUCING ULTRAPURE ALUMINUM FOR MEGABIT MEMORIES

Paris L'USINE NOUVELLE (PRODUIRE supplement) in French 19 Mar 87 p 22

[Article by Jean Roume: "Nicolas Zarpas' Ultrapure Aluminum"]

[Text] At this moment, Nicolas Zarpas is the only man in the world able to supply you with ultrapure aluminum (99.999 percent purity) containing less than 100 particles per 1,000 billion (100 picograms per gram) uranium or thorium.

"This second characteristic complements the first one," he explains, "and makes it into the ideal material for manufacturing microcomputer connections." It ensures that the metal does not emit alpha particles, which reduce component reliability over time.

Nicolas Zarpas, 47, has trouble defining his role as being research, manufacturing, or sales, because he is everywhere at the same time. His headquarters are situated in laboratory 2 of Pechiney's research center at Voreppe near Grenoble.

There he organized and led the interdisciplinary team that developed the ultrapure aluminum manufacturing process and the means to measure and prove its purity.

He is a manufacturer as well serving as the general manager of SATMA, a very small subsidiary of Pechiney, producing highly purified aluminum for condensers at its Goncelin plant (Isere department). He is also responsible for the manufacture of the new metal at Pechiney's Mercus plant (Ariege department)--an industrial unit which is unique in the world with a capacity of some 100 metric tons per year. A detailed description is still being kept secret.

However, he also emphasizes the significance of his marketing efforts. While selling aluminum for condensers to all major Western electronics companies--Thomson, Philips, Siemens, Toshiba--he sensed the need for a new material for 1-megabit (and beyond) memories. The new material's manufacture began last year. While playing the role of project manager at Voreppe, Nicolas Zarpas received enough orders to convince Pechiney to invest in Mercus.

"This idea of a new market for aluminum with a high added value (more than 10 times the price of aluminum for condensers) came to me in 1984 and the actual industrial manufacturing process started in early 1987."

A "venture" which is far from finished. "Our major competitors are going to rush to develop a material with the same qualities. However, in the mean time, we will continue the dialogue with our clients and will improve our production. We are determined to go to great lengths to maintain our lead."

25024

CSO: 3698/A191

EEC LAUNCHING MATERIALS DATABASE SERVICE

Luxembourg ECHO NEWS in English No 1, 1987 pp 3-4

[Unattributed article under the "Question Mark" rubric: "Towards a European Materials Information Service"; first paragraph is ECHO NEWS introduction]

[Text] To promote development of the information market, the Commission launched a five year programme (1984-88) promoting the enhancement of specialised information products and services.

Passed by the Council of Ministers on 27 November 1984, the 25 million ECU programme provides resources to support Commission activities in six priority areas: information for industry and research; electronic publishing and image databases; reducing regional discrepancies; materials databases; patent information; and biotechnology. Following a decision of the Council of Cultural Ministers, a further priority 'libraries' was added in 1985.

In this issue of ECHO NEWS, 'Question Mark' will attempt to outline one of the Action Plan priority areas: materials databanks. In subsequent issues of ECHO NEWS we hope to cover other priority areas.

Present situation

It is generally recognised that information on engineering materials is increasingly becoming a vital resource for innovation and technical progress. Recent surveys have identified the lack of access to materials information as a serious brake on technical innovation and progress.

In the light of the growing computerisation of engineering methods for design, analysis and manufacturing in combination with the need for fast access to comprehensive, reliable and up to date information on engineering materials, the development of computerised factual databanks is now growing world-wide. However, these developments do not satisfy the requirement of easy access by professional users, such as design engineers and materials specialists in industry and research, because most of these databanks are developing in an uncoordinated way. The lack of common rules and their need to operate in a multilingual European environment are still major barriers to the widespread use of factual material databanks.

Within the framework of its five year programme on the development of the specialised information market in Europe (1984-88) the Commission of the European Communities (CEC) is now promoting the development of advanced European information services on materials properties data with the aim to provide better access to a wide range of engineering information in Europe.

A new initiative

The basic idea behind the CEC initiative is to integrate European materials information services into a cooperative European system of materials data information services.

In particular, the Commission aims at promoting the public availability of materials databanks which should ultimately cover a wide scope of engineering applications, ie

| | |
|-----------------------------|---|
| Metallic alloys and steels | Mechanical properties |
| Ceramics and glasses | Thermodynamic and thermophysical properties |
| Composite materials | Phase diagrams |
| Coatings and joints | Electrical, electronic properties |
| Plastics and rubber | Corrosion |
| Electrical materials | Processability and machining |
| Electronic materials | Performance and reliability |
| Organic technical materials | Practical engineering properties |

The CEC, in consultation with experts from all EC member countries, has identified a series of initiatives which aim at the realisation, in the long term, of a European-wide service network through close cooperation between all parties concerned.

The first step towards this aim is the implementation of a Demonstrator Programme on materials databanks. This programme has now brought together European databank producers who have agreed to cooperate with a view to integrating their services into the Demonstrator Programme which is designed to become a pilot to the future European System.

The Demonstrator Programme will, for the first time, integrate most of the European online operational databanks in a way which is expected to provide easier access, better transparency, more comprehensive services and a better response to user needs.

These features will be accomplished by:

- Harmonisation of databanks and their related services; this will include a standard terminology, harmonised data representation, multilingual features, user support.
- The project had to result in at least a prototype service with customers. The Commission was not interested in supporting a study or a one-off device.

From this evaluation 3 of the 11 were retained. Unfortunately 2 of these 3 did not pursue discussions on the terms the Commission offered (a maximum of 49% support for the development phase). The only project funded was that from Geonet of Haunetal, West Germany who proposed a service which could make use of their existing electronic mail facility.

II. The pilot service: After almost one year of development work, the IIF is now at a stage whereby it can be disclosed to a wider public.

A test period of about 6 months will start in early May and will give trial access (to a number of pilot users) to approximately 35 databases covering complementary subject areas implemented by 8 different hosts (ECHO's 'Dianeguide' database being just one of them). The pilot users will be asked to provide their comments and criticisms, all of which will be evaluated and implemented on the IIF if deemed necessary.

All pilot users will be required to pay for the information they receive during the 6 month trial period but will benefit from reduced 'usage' tariffs given their pilot role in the IIF study.

In order to obtain objective feedback from this pilot service, pilot users will be chosen from all corners of the user community, ie they will range from experienced users through novices in the field of online information retrieval.

It is important to stress the fact that this service is not meant to help the 'experienced' user, but rather to encourage 'new users' to go online for the first time.

ECHO users interested in acting as pilot participants should call the ECHO help desk for further information.

The basic principle behind the IIF is one of choice for the user, unlike some similar systems who 'take over' the search. This starts from the choice of either a 'menu mode' (question/answer) or 'command mode' where the user deals directly with the host/database if he/she wishes. The user can switch between the two. Also the IIF will, wherever possible, offer the user a choice of service suppliers for his search.

Another feature will be that at any time the user may forward a message to a 'help' mailbox and get a response at the next login. Also in IIF, users who find the searching too difficult will be able to 'auction' the question to a panel of information brokers (this service will not be available in the early part of the trial).

III. The commercial service: After the, hopefully, successful pilot phase, a real commercial service will be established which should help new users to use online services. It is hoped that this commercial service will be available to everybody by the beginning of 1988 and that the number of databases then available will at least have doubled.

CSO: 7698/A219-E

MBB-ERNO DEVELOPS FOUR-NEWTON ENGINE

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 453,
10 Apr 87 p 13

[Brief] Based on its many years of experience with twin-element, liquid fuel engines, MBB-ERNO has developed a 4-Newton engine at its Lampoldshausen factory. The intent is that it will contribute to the expansion of MBB-ERNO's product range as a new generation of orbital and attitude control engines. A press statement from the company says that the engine at its current stage of development has no competition.

Verification and demonstration hot runs, which were carried out at the end of 1986 on the new MBB-ERNO pl2 test bed, were completed satisfactorily. A new world record of 25 hours continuous operation was established for twin-fuel engines. The new 4-Newton engine is a candidate for the attitude control system of the Mariner Mark II CRAF planetary probe. In accordance with the requirements of this mission, the hot test runs in Lampoldshausen were defined by the Jet Propulsion Laboratories (JPL). The series of tests was financed by the BMFT/DFVLR-PT [Ministry for Research and Technology/German Aerospace Research and Test Institute].

The engine has several special distinguishing characteristics: high power output in pulse operation, a wide operating range from 2 to 5.5 Newtons, stability with regard to fuel temperature (from 5 to 60 degrees C) and an innovative and simpler combustion chamber construction. Additional use of this technology has been proposed for the attitude control engine for the European space vehicle Hermes.

9581

CSO: 3698/M275

BASIC PLANS FOR HERMES, ARIANE 5 UNDER REVIEW

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 453,
10 Apr 87 p 11

[Briefs] Following an examination of the safety requirements for the European space vehicle Hermes and a detailed analysis of the previous plan, a new basic design for Hermes and Ariane 5 is currently being studied.

In the new design, Hermes total weight will be 21 tons, in a circular orbit of the earth at a height of 500 km, at an inclination of 28.5 degrees. This includes a 3-ton payload and 1.5 tons of fuel. In order to achieve a corresponding thrust in the Ariane 5 launch vehicle, the fuel capacity of the two solid fuel booster rockets would have to be increased from 190 tons to 230 tons, and that of the cryogenic main stage from 140 tons to 155 tons.

Safety improvements would consist of a separable pressurized cabin for the three-man crew, a pressure-augmented cargo hold and corresponding changes in the main body. A working group consisting of representatives from ESA [European Space Agency], the national space agencies and from industry will examine the designs for Hermes, Ariane 5 and the planned free-flying materials research laboratory (MTFF), which will occasionally be manned, to see that they correspond and present its report in May 1987.

9581

CSO: 3698/M273

EUROPEANS WANT NON-MILITARY, INDEPENDENT SPACE STATION

Stockholm NY TEKNIK in Swedish 22 Apr 87 p 7

[Article by Miki Agerberg]

[Text] Paris--Military use of the space stations would make it impossible for Europe to participate.

"The long-range goal is an independent European manned space station. The goal remains the same-- regardless of whether or not cooperation with the United States breaks down. Our methods for achieving the goal would change, however."

This was stated by Fredrik Engstrom, head of the European space station program.

Fredrik Engstrom from Sweden, who works at the European Space Agency (ESA) in Paris, is head of the Columbus space station program and, consequently, he is responsible for the European part of the joint space station.

He agrees that possible militarization of the space station is the greatest obstacle to an agreement.

"During the next few months, the United States must decide so that the European nations will know what they must take a position on," he said.

Completely Civil

Fredrik Engstrom stressed that, in the past, the United States always presented the space station as a completely civil project. If the United States now decides to use it for military purposes, it would be impossible for Europe to participate.

"The ESA regulations stipulate that its purposes are peaceful," he said.

"The boundary between military and civil use may be subject to debate. If, for example, the Defense Research Institute (FOA) has a pharmaceutical

research program, it can hardly be viewed as military. But military activities would put us in an extremely difficult position."

Plans are for the joint manned space stations to consist of four connected pressurized modules: one European, one Japanese, and two American (See NY TEKNIK, 1987:4). Together, they form a single environment in which astronauts can live and work for a long time.

Unacceptable

What will happen now if the United States reaches a decision that is unacceptable for Europe and claims the space station for military purposes?

"That would mean there would be no European module in the space station," Fredrik Engstrom said.

But that would not be the end of the European space program.

The ESA is now preparing an extensive space program with a powerful new carrier rocker, the Ariane 5, a European space shuttle, the Hermes, and the Columbus space station program.

In addition to the much-discussed space station, the Columbus program also contains three other elements. These are wholly or partly independent of the United States: a small unmanned research platform (Eureca), a large unmanned observation platform (Polar Platform) and a separate laboratory platform where astronauts can stay for up to 1 month at a time (Man Tended Free Flyer).

'Free Flyer'

To be sure, present plans call for sending up the first Eureca platform with an American space shuttle and the "free flyer" will be launched from the joint manned space station.

"But these plans can be revised," Fredrik Engstrom said. "If we cannot even reach a service agreement with the United States, then the 'free flyer' could be launched from the Hermes, instead. That would mean changes and delays, but not an end to the program."

"Today we have two goals," he said. "They are an independent European manned space station and, secondly, cooperation with the United States toward that first goal."

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CSO: 3698/453

BRIEFS

SPOT 2 TESTING--While celebrating the Spot 1 earth observation satellite's first anniversary in space (5,256 revolutions and transmission of 255,000 photos of the globe's surface), engineers and technicians at Matra Espace are completing the second satellite. For two weeks, Spot 2 has been undergoing thermal vacuum tests at Interspace in Toulouse: The satellite (1,840 kg and 4.5 m high) was placed in a vacuum chamber and subjected to temperature cycles ranging from -10 to +50 degrees Celsius. After testing the electronics, another 2 weeks will be dedicated to testing the onboard software. By midyear, the engine will be preserved for launching in early 1989 at the latest. Almost identical to Spot 1, Spot 2 has some supplementary equipment--called Doris--for tracking the satellite's exact location. Also, development activities for Spot 3 have already started, and Matra has undertaken preliminary studies for Spot 4, which will be considerably improved (equipped with an infrared channel and a "vegetation" instrument especially designed to identify agricultural resources). [Text] [Paris L'USINE NOUVELLE in French 12 Mar 87 p 68] 25055

CSO: 3698/A185

BIOELECTRONICS, EEC POLICY HEAD TOPICS IN BIOEXPO 87

Paris DOSSIER DE PRESSE: PRESENTATION DE BIOEXPO 87 in French Mar 87 pp 10-17

[Press release for BIOEXPO 87]

[Text] The Professional Conferences

Intended for French and foreign biotechnology professionals, the conferences are being held, in parallel with the exhibition, from 25 to 27 March in two meeting rooms. The conferences are being conducted by more than 90 leading figures not only from all parts of France, but also from Belgium, the FRG, Luxembourg, the UK, the United States, and Japan.

To better satisfy the expectations of the various audiences concerned, two distinct programs have been developed this year: one economic-political, the other technical.

Three major topics will be dealt with in the economic-political program: "European Biotechnology Strategies," "The Impact of Biotechnology on National Health Strategies," and "Regional Biotechnology Strategies."

The technical program will include sessions on agriculture, with a special day termed "From the Transmuted Cell to the Cultivated Plant;" health, under the title "Monoclonal Antibodies and Nucleic Probes;" and bioelectronics, entitled "Biosensors, Biochips, Biomemories."

These programs have been prepared by a committee composed of Daniel Thomas, professor at the Universite Technique de Compiègne (UTC) and director of the "Biotechnology on the Move" pilot program; Pierre Feillet, director of Glucide and Protein Technology at the National Institute for Agricultural Research (INRA); and Gerard Nomine, chairman of Organibio.

To meet the needs of the heavy attendance from abroad--especially from Japan and the United States--French-English-Japanese simultaneous interpretation is to be provided in the two meeting rooms.

The Economic-Political Program

European Biotechnology Strategies (Wednesday 25 March)

The institutions of the EEC have a key role to play in strengthening Europe's biotechnology capabilities. In fact, the Community programs already aim to create a common market for biotechnology products and services through the gradual harmonization of national legislative provisions and prices of agricultural raw materials (sugar, starch, oils, etc.).

Bioindustry being based on know-how, the protection of intellectual property is also essential. This explains the Community's interest in patent regulations and the protection of agricultural varieties.

Indeed, Europe must strengthen its scientific capabilities and encourage collaboration between member states so that the teams working on multidisciplinary projects can combine the specific abilities required to keep in the forefront of research. Also, Community research programs strive to ensure the competitiveness of the technology needed for European industry and agriculture.

Such are the many topics to be discussed on this day organized by the Commission of the European Communities and led by various commission officials. Among the speakers are two leading figures representing quite different outlooks: Dr Duncan Davies, chairman of The Society for Chemical Industry; and Xavier Fels, director of the EUREKA Secretariat.

The morning session is chaired by Tom Garvey, director for the agro-food, pharmacy, and chemistry sectors in the General Directorate for the Domestic Market and Industrial Affairs (DG III) of the EC Commission and chairman of the Interservice Committee for Biotechnology Regulations.

After an introduction by Tom Garvey on the theme "Toward a European Biotechnology Common Market," three papers will be read:

- "Industrial Use of Sugar and Starch: A Year's Experience with New Regulations," by Paul Gray, DG III, Agro-Food Division;
- "Biotechnology Intellectual Property Law: The Challenge for Europe," by Robert Coleman, DG III, Intellectual Property and Unfair Competition Division;
- "Toward a Community Biotechnology Strategy," by Mark E. Cantley, DG XII, Concertation Unit for Biotechnology in Europe (CUBE).

The afternoon covers "Industry and Community Biotechnology Programs."

The three presentations below are to be followed by a discussion among the lecturers and those attending the conference:

- "Community Biotechnology Research Programs," by Dreux de Nettancourt, DG XII, Genetics and Biotechnology Division;
- "Toward Greater Industrial Cooperation," by Duncan Davies, chairman of The Society for the Chemical Industry (Note: D. Davies formerly served with ICI,

where he was in charge of R&D, and in the UK Department of Trade and Industry);

- "A Chance for Biotechnology Cooperation," by Xavier Fels, director of the EUREKA secretariat.

Impact of Biotechnology on National Health Strategies (Thursday 26 March)

This session organized by G.A. Marcel, director of Health Development, Roussel-Uclaf/SNIP [National Syndicate of the Pharmaceutical Industry], and J. de Kervasdoué, chairman of Sanesco, begins with a presentation by G.A. Marcel entitled "What Can Be Expected from Biotechnology in the Medical Field in the Year 2000?"

The therapeutic aspects then will be dealt with in the morning session with two presentations: "The Role of Biotechnology in the Body's Defenses: Lymphokine and Cytokine," by Professor J.P. Revillard of the E. Herriot Hospital; and "The Role of Biotechnology in the Fight against Thrombosis," by Professor M. Samama of the Hotel-Dieu hospital.

The diagnostic aspect will then be discussed in two talks: "DNA Probes," by Professor J. Rosa of the Creteil Medical School; and "Home Diagnostic Products," by A. Funes of Cerba Laboratories.

After an introductory briefing by J. de Kervasdoué, the afternoon will be devoted to a roundtable discussion on the economic aspects of national health strategies. Those participating are: J.P. Raynaud, Roussel-Uclaf; J. Martin, Institut Merieux; A. Funes, Cerba Laboratories; Mrs F. Belaisch, INSERM [National Institute for Health and Medical Research]; and Dr Dixsaut, representing the general director of the Health Department.

Regional Biotechnology Strategies (Friday 27 March)

This day of the conference is to be chaired by its organizer, P. Monsan, chairman of ADEBIO [Association for the Development of Bioindustry], and is to begin with a presentation of regional achievements in biotechnology. The speakers will show how biotechnology transfer structures have been put in place in local university, scientific, and industrial environments. The participants are:

- B. Marty, CT BIO (Cote d'Azur);
- G. Goma, Microbiology and Biotechnology Transfer Center (Midi-Pyrenees);
- G. Blanchard, CRITT (Bretagne);
- G. Serghaeraert, Center for the Exploitation of Glucides and Natural Products (Picardy);
- Professor R. Julien, Biolimousin, University of Limoges.

Following a review by Mr Monsan of the work at ADEBIO on biotechnology transfer, the afternoon will be given over to two roundtable discussions.

The first roundtable on "The Problems of Funding Biotechnology: Regional Examples" will bring together J.B. Borfiga, BioEurope; Mrs A. Challamel Tricot, IDI [Industrial Development Institute]; B. Daude, Innolion; P. Geynet, Banexi; Prof R. Julien, Biolimousin, University of Limoges; J.P. Malet, Finnovebio; Mrs M.J. Mantione, ANVAR [National Agency for the Implementation of Research]; T. Thomann, IDI; and Y. Roucaud, Transia.

The topic for the second roundtable is "What Is the Optimum Regional Structure for the Development of Biotechnology?" The following leading figures in the field will participate: Mrs G. Berthiller, CNRS [National Center of Scientific Research]; P. Bouvier, CRITT Midi-Pyrenees; J.R. de Laroche, CT BIO; P. Monsan, BioEurope; Mrs C. Rassenfosse, advisor to the Office of the Minister for New Technology and External Relations of the Walloon Region; Mrs C. Sado-Tudway, MRES; G. Siest, Biotechnology Institute of Nancy; J.C. Tirel, INRA; G. Serghaeraert, Center for the Exploitation of Glucides and Natural Products; and D. Thomas, MRES.

The Technical Program

From the Transmuted Cell to the Cultivated Plant (Wednesday 25 March)

The progress achieved in the in vitro manipulation of plant cells, whether or not associated with the possibilities offered by gene transfer, has been such that the plants developed from this research are today growing in the fields.

The subject of this day, organized and led by Alain Deshayes, director of research at INRA and project officer on the staff of the scientific director for plant production of INRA, is to provide an overall view of all the techniques for proceeding from the transmuted cell to the plant. The plant is considered not only as being of laboratory interest, but also as having an agronomic interest and thus intended for cultivation and sale.

The day will begin with an introduction on "The Specificities of the Plant Cell," by Dr A. Berkaloﬀ, professor at the University of Paris-Sud and at the Institute of Microbiology.

For many of the plant manipulation and transmutation operations, in vitro culture is indispensable, but all species do not lend themselves to such culture with the same ease.

The description of the techniques used in and of the problems posed by the expression of foreign genes introduced into the genome of plant cells will then be considered in three papers:

- "In Vitro Plant Cell and Tissue Culture," by Dr G. Wenzel, Federal Biological Office for Agriculture and Forestry, Institute for Resistance Genetics (FRG);
- "Transmutation Techniques: Their Efficiency and Their Limits," by Dr I. Negrutiu, Free University of Brussels, Laboratory for Plant Genetics, Institute for Molecular Biology (Belgium);
- "The Expression of Genes Introduced into the Nuclear Genome of Plants," by Dr L. Willmitzer, Institute for Gene Biological Research (FRG).

In part II emphasis will be placed on existing or anticipated uses of the various possibilities which these techniques offer for agriculture. Four topics will be dealt with:

- "In Vitro Plant Multiplication," by Dr C. Martin, Plant Physiopathology Station, INRA;
- "Somaclonal Variation," by Dr V. Petiard, Plant Genetic Service, Francereco;
- "Mass Somatic Embryogenesis," by Dr V. Petiard, Plant genetic Service, Francereco;
- "Which Are the Genes Whose Transfer Is Agronomically Advantageous?," by Dr M. Van Montagu, State University of Ghent, Genetics Laboratory (Belgium).

As the emergence of biotechnology techniques poses new legal issues of industrial property rights on innovations, a paper will be read on "The Legal Protection of Plant Biotechnology Developments" by J. Warcoin, Regimbeau cabinet.

To close the day, the development of biotechnology techniques will be presented in two papers, one from the standpoint of the seed selectors, the other from that of the manufacturers engaged in these new fields of activity:

- "The Importance of the Seed Market in the World of the Seed Selectors Given Biotechnology Developments" by M. Desprez, Florimond Desprez;
- "Diversification of Large Industrial Groups into Plant Biotechnology" by Dr P. Steck, Phytotechnology Department, Sanofi Elf Biorecherche.

Monoclonal Antibodies and Nucleic Probes (Thursday 26 March)

This day of the conference, organized by J. Kadouche, includes a series of roundtables and starts off with an introductory presentation on "The Uses of Monoclonal Antibodies and Nucleic Probes in Diagnosis: Advantages and Disadvantages" by S.O. Warnaar, Centocor (United States).

During the morning session, applications of monoclonal antibodies and nucleic probes in diagnosis will be considered in two discussions.

The first of these, devoted to animal health and veterinary medicine, brings together the following leading figures in the field:

- P. Mauleon, moderator, INRA, "General Presentation;"
- G. Somme, Clonatec, "Progesterone Dosage in Milk;"
- J.P. Lecocq, Transgene, "Use of Monoclonal Antibodies in a Vaccine Development Strategy;"
- D. Shaw, Agritech (United States), "Diagnostic Use in Veterinary Medicine;"
- J. Laporte, INRA, "Use of Monoclonal Antibodies and Nucleic Probes in Veterinary Medicine;"
- M. Kirstenbaum, CEA [Atomic Energy Commission], "Sexing Embryos with the Help of Molecular Probes."

The second discussion, a roundtable, deals with agriculture, the agro-food sector and the environment. The participants are:

- P. Feillet, INRA, moderator;
- M. Bonneau, Transia, "Use of Monoclonal Antibodies in the Detection and Neutralization of Lactic Fermentation Bacteriophagic Attacks;"

- M. Van Hoegaerden, Chemunex, "Use of Monoclonal Antibodies in the Dairy Industry, Diagnostic Aspects;"
- H.V. Van Regenmortel, CNRS, "Use of Monoclonal Antibodies in the Diagnosis of Viral Infections in Plants;"
- M. Gib Debusk, Environmental Diagnostics (United States), "Use of Monoclonal Antibodies in the Environment Field (rapid diagnostic applications);"
- J. Dunez, INRA;
- J. Hermier, INRA.

The principles of use on monoclonal antibodies and nucleic probes will be examined in the afternoon in the following papers:

- Prof R. Masseyeff, University of Nice, moderator, "Monoclonal Antibodies and Non-Isotopic Techniques;"
- P. Lebacq, University of Orsay, "Nucleic Probe Use Theory;"
- C. Darte, Hybritech (Belgium), "Immunocentrations: ICON;"
- D.H. Katz, Quidel (United States), "Dipsticks;"
- M. Herzberg, Organics (Israel), "Immunocomb;"
- C. Kirkemo, Abbott (United States), "Test Pack."

Mass production of monoclonal antibodies and nucleic probes and their purification are the subject in the afternoon of a final presentation moderated by Y. Fouron, Bio-Response (United States), J. Kaldouche, and P. Pouletty, Clonatec.

The following topics will be discussed:

- "Microencapsulation Technique: Encapsel" by A.P. Jarvis, Damon Biotech (United States);
- "Hollow Fiber Technique: Acusyst" by T. Murphy, Endotronics (United States);
- "Biofermentation" by Y. Fouron, Bio-Response (United States);
- "Production of Nucleic Probes" by P. Lebacq, University of Orsay;
- "Purification of Monoclonal Antibodies, FPLC Chromatography" by M. Adams, Pharmacia (Sweden);
- "Purification of Monoclonal Antibodies: Clin Midy's Experience" by M. Laprade, Clin Midy.

As a conclusion to the day's discussions, T.J. Clark, European Business Associates (Luxembourg), will give a talk on "Monoclonal Antibodies and Genetic Probes: Their Impact on the World Market for Diagnostics (Rapid Diagnostics and Non-Isotopic Diagnostics)."

Bioelectronics: Biosensors, Biochips, Biomemories (Friday 27 March)

This final day, organized by Daniel Thomas, professor at UTC and director of the pilot program "Biotechnology on the Move," starts with two talks on biosensors:

- "The New Biosensors" by Prof J. Karube, Institute of Technology (Tokyo, Japan);
- "The Industrial Reality of Biosensors" by Prof P. Coulet, ESCIL Lyons.

The morning will continue with the topic of molecular electronics. Following an introduction by Prof J.M. Lehn of the College of France, Prof J.P. Launay, University of Paris-VI, and Dr A.P.F. Turner, Cranfield Institute of Technology (UK), will discuss "Molecular Signal Processing" and "Bioelectronic Perspectives."

The afternoon program will include three talks:

- "Model Systems for Biological Data Processing" by Prof M. Thellier, University of Rouen;
- "The Reality of Bioinformatics" by Prof P. Oudet, INSERM Strasbourg;
- "Bioinformatics in EEC Programs" by M. Cantley, Commission of the European Communities (DG XII, CUBE).

A roundtable on the topic "Molecular Electronics and Bioelectronics: An Opening for Industry" will close the day. This session has been organized by Joel de Rosnay, advisor to the Pasteur Institute, and will bring together:

- A. Barraud, CEA Saclay;
- Dr T.E. Gareth Roberts, Thorn-EMI (UK);
- G. Bauman, Biotechnology Center, Duke University (United States);
- J.P. Launay, University of Paris-VI.

25050

CSO: 3698/A194

EUREKA CELL CULTURE PROJECT OUTLINED

Plaisir SOCIETE BERTIN ET CIE in French 26 Mar 87 pp 1-3

[Brochure by A. F. Dufaut "Animal Cell Culture: A EUREKA Project"]

[Text] Removing cells from a living body, placing them in an industrial-type reactor, and maintaining the necessary conditions for them to synthesize and produce proteins important for therapeutic use--this is an industrial project beginning to take shape. It involves the production of key molecules for the pharmaceutical industry: vaccines, hormones, monoclonal antibodies, interleukines, etc. Current progress in genetic engineering significantly boosts the value of these "in vitro" cultures.

The industrial methods in current use are adaptations of industrial fermenters based on microorganisms such as yeasts, fungi, or bacteria.

But animal cells are much more difficult to grow than these microorganisms. They are indeed more complex and fragile and have much stricter nutritional requirements. Some of them can be cultured in suspension, whereas others can survive only on a solid medium. Current processes are moreover characterized by batch operations, time limits on cell use, the use of microcultures, when needed, and of large-volume reactors, i.e., expensive equipment, to produce the desired proteins in large quantities.

Manufacturers, particularly in the United States, are therefore interested in the development of more efficient and simpler reactors.

In the context of the European EUREKA project, manufacturers and researchers have undertaken to develop the culture system of the year 2000, which will make it possible to:

- culture cells continuously,
- culture them for long periods.

Many problems must still be resolved:

- choice of cell lineages according to the products desired and the cells' capacity for long-term production;

- identification of nutritional requirements and possible use of inhibition or intoxication to produce synthetic environments suitable for continuous culture;
- design of better reactor systems with which the conditions necessary for continuous operation could be maintained;
- development of cycles for product purification and conformity;
- microcomputer control and maintenance of optimal conditions for production.

The participants have begun work, with the Bertin company in charge of national and international coordination.

The project's basic aspects are under the direction of two laboratories in Nancy:

- INSERM [National Institute for Health and Medical Research] (Medical Biochemistry Laboratory),
- CNRS/ENSIC [National Center for Scientific Research/Advanced National School for Civil Engineers] (Laboratory for Chemical Engineering Sciences).

Participating manufacturers are:

- Bertin (France)
- Immuno A.G. (Austria)
- Merieux Institute (France)
- Rhone-Poulenc (France)
- Sorin Biomedica (Italy)

The program is due to run for 3 years and its total projected cost is 25 million ECU's.

The French participants' initial work has received support from the Ministry of Research and Higher Education (PRT [Fund for Research and Technology]) within the framework of the Biotechnology Mobilization Program.

25046

CSO: 3698/A205

BRIEFS

SPACE RESEARCH COMPANY--Established just one year ago to develop the industrial use of microgravity (notably for biotechnology and pharmacy), the European company INTOSPACE (a limited liability company under FRG law) totals 93 companies. It has an equity of one million D-marks, 17% of which is held by the French shareholders Aerospatiale, Baikowski-Chimie, Bioeurope, Matra, Michelin, Pechiney, Rhone-Poulenc, Sacilor and SEP-Societe Europeenne de Propulsion. The remainder of the equity is held by the German shareholders (44 companies with 45.7%), Italians (15 companies with 26.5%), British (8 companies with 5%), Swiss (13 companies with 2.5%), Dutch (1 company with 1%), Swedes (1 company with 1%), Spanish (1 company with 1%) and the Belgians (1 company with 0.3%). France is discussing the possibility of protein crystallization experiment to take place in two phases: process qualification in space in 1988-1989 and then a commercial flight. Preliminary approval has been granted and it had even been hoped that the project would be ready for the forthcoming Franco-Soviet flight in 1988 but there was not sufficient time. This experiment on the Soviet station Mir would have been the first concrete application of the agreement signed in June 1985 between Aerospatiale, CNES (France's national space research center) and three leading French pharmaceutical companies (Rhone-Poulenc, Roussel-Uclaf and Sanofi). [Text][Paris FTS--FRENCH TECHNOLOGY SURVEY in English Apr 87 p 7]

CSO: 3698/A232-E

EUROPEAN SUPERCOMPUTER PROJECTS DESCRIBED

Paris ZERO UN INFORMATIQUE in French 16 Mar 87 pp 40-41 [Article signed P.L.: "Supercomputers: Increasingly Ambitious Projects"]

[Text] Researchers and engineers are fascinated by the design of ever more powerful computers. There are plenty of projects, some of which will produce the supercomputers of tomorrow.

Their names are Isis, Opsila, Supernode, Suprenum, Cedar, etc. Their goal: to ride the waves of Gflops with ease. (Footnote 1) (Gigaflops or billions of floating point operations per second) They may one day replace today's champions: Cray X-MP, Cyber 205 and ETA-10 (Control Data), VP-200 (Fujitsu), S-810/20 (Hitachi), SX-1 (NEC), etc. They are the supercomputers of tomorrow.

Isis will be the first supercomputer "fully made in France." It is the product of a vast project launched by DRET (Footnote 2) (Department of Research, Studies, and Techniques of the Ministry of Defence) in 1981 and is the responsibility of Claude Timsit, high-performance systems director of Bull. An official announcement is expected at any time.

What will its basic characteristics be? Isis' central processing unit is composed of four identical and independent scalar streams linked to a vector unit. According to announcements, its top speed will be in the Gflop range, and it will cruise at 800 Mflops. (Footnote 3) (Megaflops or million of floating point operations per second)

Opsila, the result of projects by DRET and CIMSA/SINTRA [Military Aerospace Data Processing Company/New Radioelectric Techniques and French Electronics Manufacturing Company], is under study at the Signals and Systems Laboratory (LASSY) of the University of Nice. (Footnote 4) (Opsila's research achievements were presented during an international seminar on supercomputers organized by INRIA [National Institute for Research on Data Processing and Automation] and Simulog in February 1987. The study's goal is to show that a multiprocessor, which can be dynamically reconfigured in the SIMD [Single Instruction, Multiple Data] and SPMD [Single Program, Multiple Data] operation modes (see box), can efficiently process a wide range of applications through careful use of parallelism. According to Michel Auguin and Fernand Boeri, the fathers of Opsila, SIMD mode is well-adapted to vector and matrix processing. In this mode, Opsila should permit vectorization comparable to that of Cray

IS-type pipeline machines, with the same constraints. Programming can be done in a high-level language such as Fortran 8X. Several applications for Opsila are already emerging, including particle physics, digital image processing, and the solving of partial differential equations.

As for Supernode, it is an Anglo-French venture. This supercomputer, 50 percent funded by the EEC, will use Immos transputers as building blocks, as did Floating Point Systems' T series machines announced last April. The difference is that Supernode will be a parallel machine that can be dynamically reconfigured. For example, it should be able to adopt either a cubic or a tree-like structure as desired, which is apparently not the case with the T series.

A preliminary model of the original device should be evaluated by EEC experts at any time, and it could demonstrate the superiority of reconfigurable machines. If everything goes as planned, Supernode should reach 500 Mflops, although its production cost will be some 10 times less than that of current supercomputers. These are the stakes of large-scale parallelism.

Suprenum is the name of a MIMD-type [Multiple Instruction, Multiple Data] multiprocessor supercomputer developed in the FRG by a group of manufacturers and research institutes. (Footnote 5) (See INRIA bulletin No 109) It is the fruit of a large-scale project: the Upper system, prototype of a new generation of distributed multicomputers offering high performance and reliability. It is said that Suprenum will offer performances ranging from 10 Mflops to 1 Gflop.

Finally, CEDAR is the name of one of the many American supercomputer projects. Each American university seems to have one of its own. CEDAR is being developed at the University of Illinois. Its architecture is both parallel and vectorial, and it is thus related to both the Cray family (X-MP and 2 models) and to Control Data's ETA-10.

[Box, p 40]

What Are Parallel Machines?

More and more parallel machines are being designed to increase the power of computers. What does this mean? Simply that processes previously handled by one processor are shared by several.

"Parallel architectures can be based on two principles: concurrency and pipelining," explains Patrice Quinton, research director at CNRS [National Center for Scientific Research]. (Footnote 6) ("Supercomputers"; LA RECHERCHE No 167 pp 740-749) "Concurrency occurs when operations (or a series of operations) are carried out simultaneously by different processors. Pipelining is when a series of data moves from one processor to another, undergoing the same succession of basic operations."

Today there are three concurrency modes: MIMD, SIMD, and SPMD. Only in the first do processors truly work asynchronously. Indeed, in MIMD mode, processors execute programs on their own data with complete independence.

In SPMD mode, each processor executes its own program on its own data. But in contrast to the previous mode, the processors are periodically resynchronized.

Finally, in SIMD mode, all the (computing) processors synchronously execute the same instruction of a single program, but on different data.

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CSO: 3698/A193

BRIEFS

NEW EUREKA PROJECT--Serete and its Spanish subsidiary Sereland have acquired the European EUREKA label for their joint project for a computerized engineering unit. The goal is to provide European engineering companies and research departments with computer-assisted procedures for the design and construction of factory installations and infrastructure. [Text] [Paris L'USINE NOUVELLE in French 19 Mar 87 p 49] 25044

INTELLIGENT WORD PROCESSOR--The Psychological Behavior Department of the Catholic University of Nijmegen (KUN) presented a prototype of an intelligent word processor at the Hannover Fair. The word processor was developed in ESPRIT's "Intelligent Office Workstation" project. The word processor offers the user new forms of support, based on linguistic knowledge. The word processor can, for example, correct syntax errors. According to Nijmegen researchers, the most important feature is a so-called "grammar spreadsheet." Using this spreadsheet the text can automatically be adapted when a word is changed. For example, when a singular word is changed into a plural, the verbs will be automatically adapted. In addition, the machine also has the standard functions of a word processor. Prof Dr G.A.M. Kempen, head of the Nijmegen department, stresses that it is a prototype. Development of a marketable product remains to be done. The university is now attempting to interest companies in the prototype. According to Kempen, reactions at the fair had been very positive thus far. The prototype is at present operating on a Symbolics machine especially developed for artificial intelligence applications. Moreover, the Van Dale dictionaries have been incorporated. For marketing purposes, the word processor will have to be implemented on less expensive hardware and an arrangement will have to be made for the use of dictionaries. Furthermore, it will be important to develop versions in languages other than Dutch. In view of the general structure of the word processor, Kempen does not foresee any insurmountable obstacles in this respect. [Text] [Amsterdam COMPUTABLE in Dutch 13 Mar 87 p 23] 25044

CSO: 3698/A244

FRENCH CIM ENGINEERING LEADERS INTRODUCED

Paris PTS—FRENCH TECHNOLOGY SURVEY in English Mar 87 pp 3-4

[Text] Three years after making their debut in the field of factory automation, three major French engineering groups—THOMSON-SODETEG, SGN and SERETE—have established clear trends for the future development of their CIM expertise.

The THOMSON group has gained entry to the CIM market via its subsidiaries SODETEG (industrial planning experts), SODETEG-TAI (manufacturing engineers) and THOM'6 (developers of CAD and computer-aided production management systems). Design of applications software and systems architectures at THOM'6 requires the capacities of some 200 employees and generates 30 % of the company's total sales turnover. SODETEG-TAI has geared its products to the industrial giants—machine builders, avionics and weaponry manufacturers—who were the first to implement the flexible manufacturing concept. THOMSON plans to draw the three subsidiaries closer together to create a "united front" on the factory automation market.

SOCIETE GENERALE POUR LES TECHNIQUES NOUVELLES (SGN), which specializes in advanced CIM technologies, has also endeavored to strengthen its position by acquiring new expertise, mainly from outside the group. SGN is France's leading radwaste reprocessing specialist, with a total payroll of 1800 persons and annual sales of 1.5 billion francs. The group's interest in CIM stemmed from a need for diversification, with the impetus of this effort being placed on two engineering subsidiaries—GAME INGENIERIE and ESIA. The first of these has remained active in traditional SGN sectors (robotic work cells for the nuclear industry and automated glass cutting lines), but is expanding mainly into light industry. ESIA, whose activity centers on computerized manufacturing processes, is currently registering an annual growth rate of 40 %. A first step has been made toward integrating the subsidiaries' engineering know-how by involving them jointly in the development of flexible manufacturing systems (machining shops and two oxygen cutting lines).

SERETE, one of France's CIM pioneers, has been carefully shaping an automated factory engineering strategy since 1981. The firm was quick to realize that conventional engineering methods were not adapted to CIM standards and required a new type of horizontal interfacing between specialists from various engineering disciplines. This led to creation of Maps, a method now used by all those involved in the company's CIM projects. The purpose of this method is to optimize automated factory design by ensuring a consistent approach to products, processes and materials flow. In an effort to reach potential small- and medium-sized industry clients, SERETE has developed a vast network of branch offices throughout the various regions of France.

BRIEFS

ASEA'S NEW ELECTRONICS LABORATORY--Asea has started a new research laboratory for computer development at the research park Ideon in Lund. It will be called Koncernstab Elektronik. Asea now has four companies at Ideon. Asea invests from 6 to 8 percent of its total sales in the development of new products. [Text] [Stockholm SVENSKA DAGBLADET in Swedish 24 Apr 87 Pt 3, p 1] 9336

CSO:3698/453

EC COMMISSION 1987 RESEARCH PROGRAM OUTLINED

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 453, 10 Apr 87 pp 10-11

[Article: "EC Commission Agenda for 1987"]

[Excerpt] The 1987 agenda for the EC Commission states, "Research and technological development are of critical importance for creating a broad-based market that is both modern and competitive, and it is becoming clearer all the time that the Community must play a special, irreplaceable role in this area." The most important goal of the Commission is the acceptance and implementation of the new EC framework program. It represents the first application of the provisions of the European Unity Act, which justifies the new impulse for strengthening the Community's scientific and technological base.

The following table provides an overview of the EC Commissions planned activities in the area of research and technology:

Research and Technological Development

Implementation of the Program for Technological Research and Development (1987-1991)

- Proposal on the future role of the Joint Research Agency (Activities from 1988-1991)

Quality of Life

- Implementation of the Program for Coordinating Medical Research (1987-1989)
- Revision of the Radiation Protection Program (1985-1989)

Computer Engineering, Telecommunications, Innovation

- Implementation of the main phase of the RACE program (Research in Advanced Communication Technologies in Europe)
- Implementation of the ESPRIT Program for 1987, proposal for an enabling order for the second phase of the ESPRIT Program, 4th ESPRIT Conference in September, and presentation of a detailed agenda for the 2nd phase of the ESPRIT Program for 1988

- Conclusion of work toward the presentation of proposals on introducing the pilot phase of the DELTA Program (Development of European Learning by Technological Advance), the DRIVE Program (Dedicated Road and Intelligent Vehicles in Europe), and the EUROAIM Program (European Advanced Informatics in Medicine)
- Introduction of the preparatory phase of the TEDIS Program (Trade Electronic Data Interchange System)

Biotechnology

- Revision of the Biotechnology Program (1985-1989)
- Proposal for the pilot phase of an action program in the area of applied biotechnology in the agricultural industry

Technologies in Industry

- Revision of the BRITE Program (1985-1988) (Basic Research in Industrial Technology for Europe) and proposal for a BRITE II research program
- Proposal for a BCR program (Reference Bureau of the Community) (1988-1991)
- Revision of the "Materials" Research Program (1986-1989)

Energy

- Fusion research program for 1987-1991 and changes in the Statute of the JET joint enterprise (extension until 1992 and the entry of Portugal and Spain)
- Revision of the research program in the area of non-nuclear energy (1985-1989)
- Revision of the research program in the area of management and storage of radioactive wastes (1985-1989)
- Revision of the research program in the area of deactivating nuclear power plants (1984-1988)

Europe the Researcher

- Revision of the Support Plan (1985-1988) and proposal for a plan for joint support of large scientific institutes related to European interests
- Proposal for a new FAST Program (Forecast and Evaluation of Science and Technology in the Community) (1988-1991)
- Proposal for reorganization of the program approved by the Commission in the area of multilingual concerns
- Communications on the evaluation of the specific programs and dissemination and utilization of results from FET activities in the Community

Activities in Conjunction with Science and Technology Outside the
Basic Program

- o Continuation of the INSIS Program (Interinstitutional System for Information on Integration Services) and CADDIA (Cooperation in the Automation of Data and Documentation of Imports, Exports, and Agriculture)
- o Presentation of a green book on restructuring the telecommunications system
- o Information on the creation of a broad-band network for commercial use --TBB (Transnational Broadback Backbone)
- o Proposals for introducing joint policies for expanding information services
- o Proposal for coordinating the introduction of second-generation mobile telephone services
- o Proposal for continuing the revised SPRINT Program (Strategic Program for Innovation and Technology Transfer)
- o Proposal for steel research projects

13127
CSO:3698/M271

EEC PARLIAMENT CALLING FOR COCOM MEMBERSHIP

EEC Parliament Position

Amsterdam COMPUTABLE in Dutch 20 Mar 87 p 1

[Unattributed article: "EEC Export Regulations Inconsistent: Parliament Calls For COCOM Membership"; first paragraph is COMPUTABLE introduction]

[Text] Brussels--The European Parliament may force the European Community to join COCOM, a coordinating body that imposes restrictions on the export of strategic goods, especially to the East bloc countries. This would lead to a controversial military involvement of the European Community, but would in any event result in a uniform Community policy on export regulations.

A proposal for a motion to that effect was made in a report submitted last week by the Belgian Liberal Michel Toussaint to the European Parliament, which is currently under examination by the European Commission's legal experts. The European Commission has already calculated that approximately 40 percent of all industrial products manufactured in Europe fall under the COCOM restrictions.

According to Toussaint, "The member states will have to decide which products are and are not to be considered strategic and on this basis will have to determine their position with regard to COCOM. Such a process would also make it necessary for the member states to keep each other better informed of the rules in force and to improve coordination of these rules. It is not the first time that the joint European response to the challenges of modern technology has caused a problem."

Pressure

Prompted by European industry, especially the computer industry, and by the European Parliament via a series of reports, the European Commission has studied the export regulations imposed by COCOM and the United States and measured their effect on the movement of goods within Europe and to the East bloc countries. Little progress has been made towards adoption of a position. EC officials will shortly seek support at the highest levels for their views regarding COCOM membership and for further discussions with industry.

They have found that existing (non-COCOM) regulations on trade between the member states are possibly just as important as the strict rules imposed by the United States on the transit of those goods listed as strategic by COCOM.

Regular Revisions

According to Toussaint, the list must be revised more frequently. He commented on how long it took for small computers to be removed from the embargo list. He also pointed out that non-COCOM members such as Sweden, Austria, Taiwan, Singapore, and South Korea ignore COCOM regulations. For example, the semiconductor agreement between Japan and the United States could, according to Toussaint, result in a paradoxical situation in which U.S. allies in Europe could not import semiconductors from Japan, whereas the Soviets and the Chinese [Text missing in original].

The possible membership of the European Community in COCOM--together with the individual national members--would not be unprecedented for an international organization, but will certainly create a number of problems. Ireland, for example, is not now a member of COCOM. Membership would also give a controversial military aspect to the Community. The Community was accorded no military functions by the Treaty of Rome.

Toussaint commented on the event which led to Parliament's drafting of the report, namely the Belgian authorities' refusal to issue a licence for exporting a drilling rig to the Soviet Union after consulting COCOM in 1985. At the same time the West German Government permitted the export of a similar installation from the FRG.

Argument Seen As Foolish

Amsterdam COMPUTABLE in Dutch 20 Mar 87 p 3

[Editorial]

[Excerpt] All in all it would be extremely unwise for the European Community, as an organization, to join COCOM. The military implications of doing so are far from attractive (membership of the West European Union would be preferable). Moreover, it is even more ridiculous in that such a step can be expected to lead to economic dependency on a nation with which the EC finds itself on the verge of a trade war every week. It cannot be denied that a uniform Community policy on this matter is needed. However, the Treaty of Rome offers other ways of reaching an agreement on what may or may not be exported. Substitution of a national export licence by a European one might be preferable. Such a measure would also be more in keeping with an "Open Community."

25044

CSO: 3698/A200

EC REPORT ON ESPRIT PROGRESS, INDUSTRIAL SPINOFFS

Amsterdam COMPUTABLE in Dutch 13 Mar 87 pp 35, 37

[Unattributed article: "Successful ESPRIT Calls for Phase II: ESPRIT's Technological Achievements Overviewed"; first paragraph is COMPUTABLE introduction. The article summarizes EC publication EUR 10940 entitled "ESPRIT The First Phase: Progress and Results"]

[Text] At a time when prospects for funding are looking grim, definite proof has been given of the progress made by the ESPRIT technological research and development program. The subsidy for this EC project runs into billions of guilders. The European Commission has published a voluminous report, drawn up by some 200 semi-independent experts, discussing ESPRIT's actual technological achievements as well as its marketable applications. The funding of the second phase is on the agenda of the European Community's research ministers.

A spokesman for the commission: "We can go on for a while as best as we can, but by the middle of next year, when part of the funding scheme will come to an end, staff will have to be dismissed. This is causing a lot of high-level discussion." The report, which deals with all five technology areas of the ESPRIT program and their market prospects, was initially meant only for the major countries in the Community, France and the FRG, even though the study was commissioned by the UK, because it wanted to find out whether ESPRIT "paid for itself."

Last year the report found its way to the desk of Karl-Heinz Narjes, the European commissioner of technology, who could make good use of it in his struggle to convince Europe to spend more on research and development. He suggested allocating more than 16 billion guilders over a 5-year period, one-third of which would go to telecommunications projects. He is, of course, referring to ESPRIT projects, which are 50 percent subsidized by the Community. So far there have been no signs that the three countries are changing their "less-money-will-also-do" attitude.

Results

The current ESPRIT achievements will again come in handy to support Narjes' views in the forthcoming negotiations. The report provides a rather sober picture of the research results in all fields of the program and there are no

embarrassing stories of governments not contributing their share in the subsidy. The program, covering five sectors, includes 201 cooperative projects in which almost 3,000 people are employed.

The report also gives an overview of the 1,500 million guilders to be allocated over the next 5 years (as yet unexpended funds). The technology areas include microelectronics, software technology, data processing, office automation, and CAD (computer aided manufacturing)[as published]. The following is an overview of the progress made in the fields mentioned above.

CAD

Prior to ESPRIT, computer aided design in integrated circuits was subsidized from other resources. ESPRIT's start was later in this field than in other areas. In January 1986 ESPRIT initiated an important CAD project in which six large companies are cooperating: the French companies Bull and Alcatel, the West German company Siemens, SGS Microelettronica of Italy, Philips of the Netherlands, and ICL [International Computers Ltd.] of England. Data was also supplied by other ESPRIT chip researchers working on CAD standardization.

Another 2-year old project on large-scale silicon integration is already achieving important results with industrial significance. It involves the development of silicon compiler techniques for the production of, for example, digital wavefilters. This Cathedral-1 chip will soon be followed by the Cathedral-2 chip.

Another successful project in this field is Falcon CAD, in which IMEC [Interuniversity Microelectronics Center], Bell Telephone, and Silver-Cisco of Belgium and large companies such as Philips and Siemens are participating. Falcon CAD uses CMOS technology and the design time of a particular type of VLSI multiplexer has been reduced from several months to 7 days. The findings of this research can also be applied to telecommunications.

Applicability

Several goals have been formulated for silicon processing technologies: for example, a 500-Kb demonstration chip and (by 1990) a megabit MOS circuit with 0.7-micron design rules. These very high-speed chips will also be developed in bipolar silicon technology. According to the report the projects are on schedule.

One industrial application soon to be marketable comes from Siemens, which has invested 210 million guilders in a production line for 10-K gate arrays in 2-micron technology, with 200 picoseconds in access time and three-layer metallization. The prototypes will be (mass)produced before the end of this year. According to the report, another project, by the British electronics group Plessey, last year produced samples of a 200-Kb CMOS circuit including four 16x16 multipliers and two 16-bit microprocessors. All this on a mere 2-square centimeter surface.

GaAs

The ESPRIT program also pays attention to the next generation GaAs semiconductors in order to keep pace with the American supercomputer manufacturer Cray Research, which intends to use them in its Cray III. According to the report, ESPRIT's achievements "seem to be in line with the state of the art in the entire industrial world."

In GaAs chip technology, the specific goal is to produce 10-K to 20-K gate arrays with less than 50 picoseconds in access time by 1989. One digital GaAs chip project has already resulted in a number of circuits, including a 1-K static RAM chip. One of the participants has signed an agreement with Cray Computers in the field of ASIC's (Application Specific Integrated Circuits).

ESPRIT's software component has two keywords: reusability and portability. An important project which started in 1983 has played a major role in the production of a portable common tool environment (PCTE). Six companies were involved in this project: Bull, Siemens, ICL, the West German company Nixdorf, the Italian Olivetti, and GEC [General Electric Company] of England. It involves a common software development system.

The first PCTE version was launched in December 1985 and "has gone beyond meeting the initial goals by spawning extensive complementary work both within ESPRIT and elsewhere." A commercial application of the software, Emeraude, was produced by the French company GIE-Emeraude in September 1986.

The commission's report says that PCTE has been adopted by the English ALVEY program and that discussions are going on to use it within ADA, the European-originated language used by the U.S. Department of Defense. According to the report, the X Open Group is also a PCTE spin-off. The X Open Group recommends the Unix operating system, which is also supported by the six companies mentioned above together with Digital Equipment and Sperry.

Future ESPRIT projects will manufacture general tools to run on top of PCTE, such as syntax editors, desktop software, and data manipulation languages. They also want to port PCTE to other systems, and produce formal specifications for PCTE interfaces. The final goal is the creation of a European Software Factory.

Data Processing

In ESPRIT's data processing section research focuses on increasing the effectiveness of computer systems through knowledge acquisition and engineering, man-machine interfaces, information and knowledge storage, and computer architectures. A demonstration of the first knowledge-based system software is scheduled for September 1987. This system should enable the software designer to "structure the interview process and use protocols of expert consultations to derive the knowledge needed to build an expert system."

Since November 1985 another ESPRIT project, Eurohelp, has demonstrated how users of electronical mail can find help. The report says that this is the

only industrial research project on intelligent help systems for information system users, but adds that there is another project on this topic in the University of California at Berkeley called Unix Consultant.

Logic and knowledge representation are needed to enter the experience of an expert into such an intelligent help system. In another ESPRIT project, the logic-based programming language Prolog, developed in 1970, is being extended to Prolog-III. The project, under the direction of Prolog inventor Prof Alain Colmerauer, is proceeding on schedule.

BIM-Prolog is an application of the Belgian Institute of Management and has recently become available. According to the report it is a development system including a compiler "whose object code executes faster than that of any other Prolog compiler in the world on standard benchmarks."

Interfaces

The French CRIL [Industrial Software Design and Development] and Bull groups and the New University of Lisbon had each already developed a Prolog interpreter before they started cooperating in an ESPRIT project. Together they are now recommending an international standard. A more extensive interface between the graphics standard GKS and Prolog is being developed in another project.

A number of Prolog tools have been developed for building knowledge bases for larger database systems. The Belgian BIM is already marketing a "simple and efficient" interface between its Prolog version and the relational databases Ingres and Unify. According to the report, "this is probably the most efficient commercially available interface of its kind." In addition to his work on Prolog-III, Colmerauer has developed an expert system for detecting failures in automobile engines. This project, in which the German companies Daimler-Benz and Bosch are also involved, serves as a test for wider applications. Office automation projects within ESPRIT have been so successful that no continuation is scheduled when--or if--ESPRIT phase II takes effect. Many projects aiming at standardization of network interfaces are already in an advanced stage. A whole series of projects on network architectures seek to increase transmission rates by 100 times and the distance covered by a factor of 10 over the current state of the art (according to the report Ethernet is now providing the best performances). A complete demonstration of a 25-km backbone network featuring gateways to public networks and satellite channels should take place before the end of this year.

It involves a broadband network with a data transmission rate of 140 Mbits per second and with access rates for bridges and gateways of over 2 Mbits per second (full duplex). The report remarks that such networks will find applications on university campuses and in science parks. Another project has led to the development of a broadband modem "that is likely to be marketed soon."

Protocols

For a number of networks--some of which feature transmission rates of 10 Gbits per second using glass fiber cable--all the basic protocols, network controllers, and gateways to digital networks have already been specified. One project involves developing a protocol for local area networks and a company telephone switchboard (PBX [private branch exchange]). Standardization is scheduled for early 1987.

In 1985 an older project had already established a European production standard for office automation systems. Last year it became the first version of the "International [ISO] Standard." This standard, codenamed Herode, defined a document architecture for multimedia--text, image, and voice--transmission between different systems and is already supported by a growing number of manufacturers. Since then, text processors and software tools for communications, storage, and retrieval have also been developed.

CIM

Interconnecting a factory's automated production equipment has already been scheduled for the section on computer integrated manufacturing of ESPRIT phase II. As the report states, "CIM represents a major new market for European technology and automation equipment manufacturers." Here, too, interface protocols pose the major problem. The report says that interfaces and interoperability generate 70 percent of the costs for installing a new CIM system. The commission says it will concentrate on CIM standardization projects taking into account a wide range of consumers and vendors.

The CIM standardization project is ESPRIT's largest joint project. The 20 participants are all major manufacturers, including many software houses such as the French Cap Sogeti, as well as consumers such as Aerospatiale, British Aerospace, and Volkswagen. They also implement the achievements made in this field by General Motors in the United States.

Other manufacturers are introducing the standards in their own factories: the French car manufacturer Renault, the West German BMW, the Italian tire manufacturer Pirelli, the Philips car radio factory, the large Belgian company Fabrique Nationale, and the English cable manufacturer BICC [British Insulated Callender's Cables]. The report says that in the two latest attempts "the project has shown its worth in improving interoperability and production reliability."

BMW is cooperating with an ISO [International Standards Organization] project group, Renault is developing integrated robot systems, and BICC and Philips are working on a simulation system (based on knowledge bases) for modeling production flows through different manufacturing cells. In May an ESPRIT-supported CIM conference will be held in the UK with subsidies from the Ministry of Trade and Industry. The last two meetings were held in Toulouse in 1985 and in Bremen last year.

Business Aspects

The report attaches great importance to the role of small- and medium-sized companies. The report also prefers not to see ESPRIT as "the child" of the 12 major European computer manufacturers. In addition, the report defends the 50-percent subsidy level which was questioned by the UK last year in an attempt to lower the budget for Phase II. It mentions the 50-percent support level granted by the West German Government and the 100-percent R&D funding by the U.S. Department of Defense. ESPRIT's 50-percent support level "preserves the possibility of attracting proposals that are comparable in quality and worth with those submitted under national programs that offer the same level of financial support but without the requirement of cross-border collaboration."

The participants in the different projects are also doing well. In mid-1986 90 percent of the projects were on schedule, 14 were 3 to 6 months behind, and only 8 were more than 6 months late. ESPRIT sustains a lot of R&D activities in industry and in universities. If no additional money is made available, the future of these efforts will become very doubtful.

25039

CSO: 3698/A199

EC URGES NEW SUBSIDIES FOR 'INFRASTRUCTURE' PROJECT

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 453,
10 Apr 87 p 12

Briefs] The EEC commission has proposed new ways to finance major European infrastructure projects--for example, the Paris-Cologne high-speed train. Participation by the private sector in particular is to be made easier. The commission is hoping that this will result in some impetus to create a European domestic market, the integration of fringe areas into the Community and a multiplier effect on the development of disadvantaged regions.

The commission is appealing for the "renewal" of modalities in the awarding of Community loans. One of its special recommendations is that guarantees for loans from the European Investment Bank should be made available from the EEC budget. The commission hopes that financial participation of this kind will send a signal about the banks' involvement. Finally, the commission is putting forward for discussion the creation of European infrastructure agencies based on the model of U.S. "authorities."

9581

CSO: 3689/M274

INDUSTRY GROUP URGES EUROPE-JAPAN TECHNOLOGY COLLABORATION

Stockholm NY TEKNIK in Swedish 17 Apr 87 pp 16-17

[Article by Miki Agerberg]

[Text] Paris--Europe and Japan each have strong ties to the United States. But relations between Europe and Japan are weak. They must be strengthened.

A third bridge must be built. It would create better balance in the world.

That is the basic idea found in a study conducted by European and Japanese industry leaders and politicians.

Here, Jacques Lesourne, one of the project leaders, is interviewed for the first time.

Build new bridges between Europe and Japan! Long-range cooperation between Japan and Europe on various high-tech projects would create more balance in the world and increase our independence with respect to the United States.

This is the main idea contained in a study that will be completed in late May. A group of influential industrial leaders and politicians in Europe and Japan are responsible for the study. NY TEKNIK was the first newspaper to interview one of the project leaders.

Joint development of new computer programs, cooperation on zero-gravity manufacturing in space, and Japanese participation in the development of new models of the Airbus airplane.

These are some of the areas that are mentioned in the new study. These are fields in which long-range high technology cooperation between Europe and Japan is possible.

"Europe and Japan each have highly developed cooperation with the United States. But the third leg of the triangle, cooperation between Europe and Japan is much weaker."

"For both economic and geopolitical reasons, it is important to strengthen this third leg, to develop relations between Europe and Japan."

This was stated by Jacques Lesourne, professor of economics at the famous Conservatoire National des Arts et Metiers in Paris and vice chairman of the European-Japanese project group.

The image of a triangle with two strong legs and a weak third leg was repeated again and again during the interview, the first interview he granted in connection with the project, which will be concluded at a meeting in Tokyo in late May. It is a picture of imbalance. The conclusion is built into the picture itself: in order for the system to be brought into balance, the third leg must be strengthened.

It is a striking picture, but how well does it agree with reality?

"Let me take space technology as an example," Jacques Lesourne said.

"Europe and Japan are number 3 and 4, respectively, after the United States and the Soviet Union."

"Nevertheless, there is practically no cooperation at all between Europe and Japan on space technology. On the other hand Japan and Europe both cooperate separately with the United States."

Own Space Station

This cooperation is not always without problems--this is demonstrated by the present conflict over the joint manned space station (see NY TEKNIK, 1987: 17 and 18).

If cooperation with the United States on this project should break down totally, would it be conceivable for Europe and Japan to join together and develop a manned space station themselves?

"It is too early to ask that question now," Jacques Lesourne said. But that question may well be asked in the future.

In cases such as this, it is interesting to know not only what is said, but also who says it.

This project was initiated by a group of influential Japanese who are close to Foreign Minister Saburo Okita and Professor Keichi Oshima. Their idea was for representatives of Europe and Japan to come together and examine the possibilities for long-range cooperation in high technology.

They contacted former West German Chancellor Helmut Schmidt who, like Oshima, had previously worked with the cooperative organization of the rich industrial nations--OECD.

Meeting in Tokyo

A group of sponsors, major companies and institutions was assembled to support the project and a board of important names in politics and industry was formed. Representatives came from large Japanese companies such as Hitachi, Mitsubishi, and NEC, while the Europeans came from Pilkington and Bayer and from the EC Commission.

No Swedish companies participated, but they could have done so. The study involves not only the EC, but all of West Europe.

Tactical Study

The work began in January of last year. Several weeks from now it will end with a meeting in Tokyo, where a final document will be approved and made public. A book will also appear by the end of the year.

The goal was to conduct a tactical and substantial study. The group decided to examine four areas of technology: information technology, biotechnology, space and aviation technology, and nuclear power. What possible joint project did they find?

"There are certain possibilities in space technology, where cooperation today is almost nonexistent," Jacques Lesourne said. Zero-gravity manufacturing in space is one example.

"In aviation technology, international cooperation is becoming more and more necessary. The European Airbus is already an international project. It is easy to imagine Japanese participation in this project."

"Fruitful cooperation is also possible in the production of new software for computers. Europe is far ahead in this field and the Japanese computer industry is open to cooperation."

"In biotechnology, European companies are already active in Japan. Some problems must be solved, however, such as the problem of patent rights."

"In the field of nuclear power, long-term cooperation may be possible on fusion research, breeder reactors, the automation of nuclear power plants, and the handling of radioactive waste. On the other hand, cooperation in the construction of new nuclear power plants is less likely, considering the overcapacity in the nuclear power industry."

Obstacles

What, then, are the obstacles to closer technical cooperation between Europe and Japan?

"Problems involving patent rights and standards must be solved," Jacques Lesourne said. "As an example, it would be easier to cooperate on new networks for data and telecommunications if Europe and Japan had the same standards."

"In today's situation, it cannot be denied that both Europe and Japan sometimes use different standards to protect their own industries."

Japanese industry is known for its superior ability to convert ideas into commercial products quickly. Does Europe dare cooperate with Japan?

Justified Fear

"Europe fears Japan as a strong competitor-- and this fear is justified" Jacques Lesourne said. "But going into a shell is not necessarily the best reaction. In almost every area, access to the entire world market is a necessity."

"It is true that the Japanese market is relatively closed, but when European industry has made a genuine effort it has been successful, such as the West German, English, and Swiss chemical industry."

"Europe is ahead in basic research, but Japan is better at converting ideas into products and selling them. For this reason, the Europeans must write cooperative agreements that cover the entire process from research to production, so that the Japanese will not be the only ones to make money on the research results of the Europeans. It seems that this problem can be solved."

"It would also be good for cooperation if the Europeans were open to Japanese investments in Europe. Europe has benefited from American investments in the past and I believe we also benefit from Japanese investments today."

Consequences For The United States

Of course, strong cooperation between Europe and Japan will have consequences for the third party in the triangle: the United States. Present American relations with Japan and Europe have causes that date back, in part, to the end of World War II.

Jacques Lesourne is quick to point out that the recommendations of the group are not directed against the United States. On the contrary, he stated:

"Closer relations between Europe and Japan would strengthen the entire triangle. This would be good for political and economic balance in the world."

Still, considering the American export controls and the strong American reaction to cheap Japanese semiconductors, the question must be asked: would the United States tolerate closer cooperation between Europe and Japan?

Stiff Competition

"In any case, Japan must make more and more decisions that conflict with the wishes of the United States," Jacques Lesourne said.

"It is not as if Japan would stop being an ally of the United States. But Japan holds such a strong position in the global economy that it must be able to act independently." This is what the present semiconductor conflict is all about, he believes.

The internal competition among Japanese electronic companies is so stiff that they cannot always accept the decisions of the Technology Ministry, MITI, and its agreements with the United States. Japanese society is now more filled with conflict than in the past.

A triangle with three strong sides: that is the picture Jacques Lesourne uses to describe the goal. It is a triangle with mutual relations of cooperation and conflict among all three parties: Europe, Japan, and the United States.

Important Partner In Cooperation

The way to achieve this goal is through closer cooperation between Europe and Japan. The purpose of the study is not to initiate specific joint projects or to form completed cooperative structure, such as the Eureka program for technical cooperation in Europe.

"No," he said, "we want to convey an idea and create consciousness among leading political and industrial circles in Europe and Japan."

"Our message to Japan is that Europe is an important partner in the world."

"Our message to Europe is to abandon its preconceived notions about Japan: in the long term, cooperation with Japan is a necessity. Cooperation in certain areas does not prevent lively competition in others."

"Europe must open up to Japan. But openness does not mean naivete. It is possible to find a mature position between being closed and being naive--a position that would mean both cooperation and competition."

9336

CSO: 3698/453

FRENCH RESEARCH MINISTER ON R&D POLICY

Paris L'USINE NOUVELLE in French 2 Apr 87 pp 16-17

[Interview with Jacques Valade, research minister, by Marc Chabreuil and Pierre Virolleaud: "Jacques Valade: 'Priority Must Be Given to Development of Companies'"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Aid for companies, evaluation of research findings, mobility of researchers, etc. The concern for profits is paramount everywhere.

Alain Devaquet's replacement at the Ministry of Research and Higher Education came at the same time as the prime minister's first proresearch statements. That is an advantage which should be very useful to Jacques Valade if, by March 1988, he is to take the necessary steps in an area which has been abandoned since March 1986. But with a university and research background, the senator from Gironde—"Chaban's heir apparent," as they say in Bordeaux—has several tricks up his sleeve. With his colleague in the Ministry of Industry he is presently developing a research and innovation policy to be presented to the Council of Ministers in a few weeks.

L'USINE NOUVELLE [UN]. The prime minister has announced that one of the primary targets of the 1988 budget would be research. Can you specify that target?

Jacques Valade [JV]. The public has indeed heard Jacques Chirac repeatedly state at Strasbourg, Toulouse, Lyons,... how important research is for corporate development, and he now wants us to come up with concrete proposals. Budget negotiations have not yet begun, so I cannot go into detail. Right now we see two possible interpretations of the prime minister's remarks and instructions: On the one hand, capital endowments to companies or to national institutions should encourage investment in the area of research; on the other hand, research subsidies and assistance, whether public or private, should be improved.

[UN] Will there be new direct or indirect subsidies to business?

[JV] We are looking into this question right now with Alain Madelin, the minister of industry. In the area of indirect subsidies it has become a standard response to say that tax rebates should be extended. We are now

reviewing the possibilities of altering the rules, particularly in consultation with business managers. Tax rebates could be better regulated so as to soften the effect of radical variations in the level of research investment from one year to the next.

When it comes to direct subsidies, the question is more political. The pendulum had swung very far towards removing them completely.... We notice in fact that companies still have a hard time investing in increasing research funding because the new injections of capital they receive first go to improving cash flow. But things change: In the beginning we might have questioned the very existence of the ANVAR [National Agency for the Implementation of Research], while, as the prime minister himself has confirmed, today we are determined to redefine its role. That is an important change.

All this goes along with profound changes in the way we manage our funding.

[UN] Are we talking about reforming the Fund for Research and Technology ?

[JV] Yes, we will review and improve the way these funds are used, in accordance with several principles which I, personally, feel are obvious, but which I am glad to repeat.

First principle: There is no advantage based on status. Each proposal must prove its competitiveness.

Second principle: The evaluation will be left to professionals. Committees will judge the proposals based on an evaluation of the research work.

In other words, everyone will have to account for the way funds are used, and we will decide whether we should continue to support the request being considered.

My first goal is to facilitate the transfer of research findings to industry. Do not think for a moment, though, that I am not concerned with basic research. On the contrary. We find a true consensus on that subject, and business leaders certainly support the view that we have to focus more on basic research. To summarize my view, I would say that it seems vital to me that the researcher be concerned with the potential application of his work.

[UN] Do you have the resources for evaluation which this policy requires ?

[JV] Not at the present time. There are resources for self-evaluation within organizations: a healthy discipline which each of us in the scientific community must accept. But that is not enough. There are also many centers, here and there, which conduct evaluations. But all this is very unclear. That is why the conclusions of the task the government assigned to Mr Roger Martin will soon help us to see more clearly. Lastly, within my own ministry we have begun to analyze the various independent evaluation resources and tools available to us.

[UN] Is the Superior Scientific and Technical Research Council [CSRT] among these resources ?

[JV] Yes, indeed. I attended the latest CSRT general assembly, which brings together some 50 persons from various scientific, economic, and social circles, and I expressed my interest in their work to its vicepresident, Mr Kourilsky. It so happens that, as with a part of the council, his statutory mandate is about to expire. So I entrusted Mr Jean-Pierre Causse, one of my counselors, who is also assistant general manager of research at Compagnie Saint-Gobain, with the task of renewing it.

Once that is done, we will move on to redefining the role of the CSRT, which, in my view, should be expanded. I hope to make it into more of a ministry and government council: a true superior council, like that of the magistracy. Rather than focusing on any single legal, organizational, or team problem, it would turn to much more comprehensive evaluations. I can easily imagine that for any given field it could evaluate both the level of development and the policy to be followed in France. New trends in biotechnology provide a recent example.

[UN] Do most researchers share this concern for evaluation and return on investment ?

[JV] From the outset, I believe it is important to clearly state that researchers deserve a great deal of respect from French society for their role in the national community and in its future. In exchange, they should be committed to sharing their capabilities and the products of their imagination. We will not cancel a certain research effort simply because it is not profitable. France also has a cultural mission which I am not forgetting. If one or another of my distinguished colleagues wants to study Sanskrit or Gregorian chant, that is his right. I merely say that it must be done in intelligent moderation. Once again, I can briefly state my view in saying that economic progress is, of necessity, based on the initial choice.

[UN] Researchers are criticized for not being mobile. Are they not held back by their status ?

[JV] For years it was just a matter of providing researchers with security, or at least trying to do so, by reconciling a multitude of different conditions to create a single status. Once researchers are placed in the most secure environment possible, we cannot just turn around and ask that this security create mobility. You are surely not going to hear me say that researchers should not benefit from the social advantages of other salaried workers, but I think it should be possible to create bridges from one system to another. I should mention that this is not now the case as regards salaries, pensions, or vacations. I have initiated a study of a system which would permit true mobility. I can easily imagine it taking the form of an interim status which would attract both the researcher from a university or institution moving into private industry and his colleague moving in the opposite direction.

In brief, the temporary nature of this situation must be taken into consideration and one must be able to return later to his previous status. I am fully aware that this is urgently needed from a European point of view, and that is why I have already begun a few inquiries. Today the differences are tremendous, but it should nevertheless be possible for the researcher living in London or Cologne to go and work in Montpellier, and vice versa. Admittedly, I know several British researchers working in Paris on advanced materials who are delighted to be working under the French social security system. But when a European researcher goes to the United States, social insurance coverage is nonexistent unless you make the effort to buy it. But since researchers receive grants which are barely enough to survive on, it is hard to see how they would pay for this insurance. Especially since these are usually researchers between 25 and 30, married, and sometimes with children.

[UN] Where do things stand with regard to negotiations on European programs?

[JV] The choices have been made: ESPRIT [information technologies], BRITE [industrial technologies], RACE [advanced telecommunications technologies], EURAM [advanced materials]. The last time I met with my European colleagues in Brussels, we spent some 20 hours together negotiating the contents and the financing of the framework program. Ten countries made a decision, with the UK and the FRG having to take a position quickly. Between now and 1991 some 6.4 million ECU's will be invested. This package includes the completion of earlier programs still unfinished in 1987. Since we believe that this program will not end in 1991, after heated discussion I got an agreement that at least 16 percent (900 million ECU's [as published]) would be added in 1992. But confidentially, I hope it will be more....

25051

CSO: 3698/A208

BRIEFS

SOVIET AGREEMENT IN FRANCE--A preliminary agreement has been signed between Oris Industrie (France) and the Soviet State Committee for Science and Technology. This may lead to important contracts in the following fields: medical imaging, medical bioanalysis and radiation equipment. This agreement reflects a broader will of Soviet Union to encourage high technology partnerships with western firms under new economic policy. This is another way for Soviet Union to gain access to high technology international markets where they are sometimes lacking experience. Contact: Mrs R. Peyrac, Oris Industrie, BP 21, F-91190 Gif-sur-Yvette, FRANCE. Tel: 33-1-69082502. [Text] [Paris EUROPEAN BIOTECHNOLOGY NEWSLETTER in English 11 Mar 87 p 5]

CSO: 3698/A203-E

EC PLANS FOR INTEGRATED INFORMATION SYSTEM OUTLINED

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 453, 10 Apr 87 pp 11-12

[Report: "Pilot Projects for Modern Information Technologies"]

[Excerpt] Twenty-five technicians and officials are currently working in Brussels and Luxembourg on INSIS (Inter-Institutional Service-Integrated Information System), which is using the administrative apparatus of the European Community as a guinea pig. Electronic mail, videotext, and video conferences are supposed to be combined and used as the basis for a model information company in miniature. During the last three years the project has cost a total of just DM40 million. In the meantime three components of the INSIS program have been developed: INSEM, OVIDE and VIDEO-CONFERENCE.

INSEM's task is to cut down on the mountain of paperwork through electronic text transfer. This effort is associated with the desire to cut time and cost requirements.

OVIDE is designed to cover the information needs of the European Parliamentarians by making access to Community data bases easier via an international videotext system. OVIDE is supposed to be compatible with the national systems PRESTEL and TELETEL BILDSCHIRMTEXT [Teletel videotext], which makes it the first public, Community-wide videotext system.

Finally, since the beginning of last year teleconferences have already been held between the studios in Brussels and Luxembourg. Until now the experimental facilities have been utilized up to 50 percent of capacity.

These programs are also available to the member states. For instance, the UK permanent delegation uses the line every Monday to contact various ministries in London.

Since the end of last year this pilot facility for video conferences has been capable of connecting several locations in the Community together, offering them simultaneous interpretation services.

13127
CSO:5500/M272

FRG ANALYSIS OF GDR MICROELECTRONICS, SOFTWARE PROBLEMS

Bonn DAS PARLAMENT (Supplement) in German 17 Jan 87 pp 3-19

[Article by Fred Klinger: "The Crisis of Progress in the GDR, Innovation Problems and Microelectronics"]

[Text] I. Preliminary Remark

Sub-par performance of its research potential, technological lags with respect to the world-market standard, business practices in the enterprises and combines that are hostile to innovation give cause to suspect that a new home-made crisis is impending for the actual existing socialism in the GDR: the innovation crisis. In view of the demonstrable successes of precisely this most recent economic development, this may sound like a past Cassandra's call about the collapse of socialism. But sound reasons can be given for the thesis of an innovation crisis, and clear symptoms can be recognized. Essentially there are two basic trends whose combination creates a critical state: on the one hand the technical and economic effects of the microelectronic revolution, on the other hand, the systemic innovation weakness of the centralized planning and management system. The following considerations try to delineate the phenomena, their internal connections, as well as the expected effects of current impediments to innovation.

II. The Phenomenon of Squelched Creativity

In 1985, about 200,000 workers were employed in the area of research and technology (R&D). About 60 percent of these were college graduates. Although comparisons on the basis of available data have their difficulties, the GDR scientists estimate that, "as regards the proportion of professionals employed in R&D on a country-wide scale, they have risen to an international top position." While it has a fraction of less than 0.4 percent of the world population, the GDR has an estimated fraction of 1 to 2 percent of the world's research and scientific personnel. 4.7 percent of the national income, just about 11 billion marks, were furnished altogether in 1985 for science and technology. In 1986, this sum will run to 11.6 billion marks¹.

Such empirical findings illustrate what appears obvious: A society which makes considerable expenditures for the development of science and technology and which is organized towards the industrial utilization of scientific- technical

results, like any other industrial society must also grant a central position to the significance of industrial and scientific-technical progress (compare Table 1).

But sociologists, science theorists and practitioners from the research and development areas are observing a remarkable phenomenon: The GDR has indeed built up research and development capacities, whose material and personnel resources certainly are on a par with those of developed industrial societies, but these potentials remain largely ineffective. Their virtual power would have to be activated, and transformed into actual economic-technical effectiveness². According to the nearly unanimous criticism of more recent science-policy studies and sociological studies, this point is the decisive challenge for further development.

The word "average" is overstrained when one tries to describe the current status and the malaise of existing research and development collectives. In a study of 442 college and technical school cadres and 92 collective managers, for example, it was determined that a significant "concentration of average performance" appeared especially in the age group of scientists less than 30 years old.⁴ Such results, which vanish in the highly aggregated official statistics, are naturally first obtained by more precise sociological analyses which naturally are also subject to quantitative restrictions. Anonymous interrogations of management personnel in research and development areas of the GDR have shown that these "remarkably often," had the opinion that their colleagues supposedly were "unsuitable" for research purposes. In the GDR, management cadres must regularly furnish written performance evaluations of their staff members. On comparing these anonymous interrogations with the official performance evaluations, the same staff was regularly classified with the evaluation "top employee" or "excellent researcher".⁵ As appears here, it is also true for the research and development bureaucracy of the GDR, what is true for similar organizations all around the world: They first of all create those superficial findings of apparently accurate measurements and fictitious data which they then try to administer with great effort, claims of competency, and statistical enthusiasm.

III. Centralized Decision Making and the Innovation Process

During the total duration of the annual planning effort, all stages of the administration pyramid, both horizontally and vertically, are involved in manifold coordination-, correction-, and control-processes. These extend as far as the associative or communal area. But the functional autonomy of the component systems (enterprises, combines, government facilities, etc.) is never a basic, qualitative autonomy for decision-making, but is always bound to fill up effectively a prescribed framework, and to accomplish fixed objectives according to the specification of concrete conditions. Already at the beginning of the planning period, the so-called state planning tasks - which serve as a basis for the enterprises, combines, and other organs to work their own draft plans - are directives which basically can no longer be changed. Indeed, they already are considered as "binding minimum objectives for the performances that must be accomplished".⁷

These organizational principles of democratic centralism even today are based on Lenin's classical ideas. Lenin extended the avant-garde model of the Bolshevik Party and his (sometimes) transfiguring ideas of factory discipline to the entire area of state planning and management. Because of Lenin, management and the workers' collaboration in the component structures must guarantee "the strictest unity of will".⁸

Especially for innovation processes, this hierarchy of fulfillment procedures has serious consequences. It remains unexplained in principle who, within this system, steers the helmsmen. Even if in the meantime one might presuppose that the formulation of so-called "objective social requirements" in the state planning documents is effected according to all the rules of scientific expertise, the functional logic of the overall planning sequence runs counter to elementary cybernetic insights - such as incidentally were already also emphasized by scientists in the GDR during the sixties.⁹ Accordingly, the specification of objectives and not only the fulfillment procedure would already have to be the result of an open dialogue process, which regulates and processes a multiplicity of effective feedback impulses. But in this sense, the control center consisting of the party and of economic managers at the top would not be an autonomous leadership organ which, like a puppeteer, pulls the strings of the marionettes of the economic units; rather, in its decision-making process, it would itself be controlled by the subordinate component systems.

From a technical point of view, such considerations may seem entirely justified - but at their core they violate the basic power principles of the political system. According to Lenin's schema - and its being elevated to dogma is not a random accident - this system is directed towards maintaining universal access to all relevant social needs.¹⁰ Precisely for this reason, what holds for planning and management of economic matters in general also holds for the control of innovation processes: The deterministic specification of planning objectives and the uniform, controlling access from the top.¹¹ Thus, in research and development plans (the "State Plan" or the "Plans for Science and Technology") there exists the enduring tendency to specify the respective task definition as the expected result, and finally to evaluate the latter correspondingly as the result of planning.

Control of the future appears perfect. One already knows in advance what it is that one really wants to know. This may appear as an incredible simplification of GDR planning practice, but basically coincides with the critical objections of various GDR authors. Thus, in a study "Intensification of Research", it is pointed out that research processes must be understood as developing systems. This means as systems which on the one hand must be set up with sufficient openness to be able to do justice to spontaneous, unforeseen developments, and which on the other hand must be correspondingly flexible to reassign research potentials and to modify problem emphases - when required - in a self-regulating fashion.¹² In other words: Well-formulated and fixed task definitions in research plans (science and technology plans) can at best serve up already available knowledge or can presuppose foreseeable results. For the generation of new ideas such planning premises are unsuitable. Such a "constricted view" of research planning, as the authors of the research study allow, can "still" be encountered in actual practice. It is necessary to "distance oneself decisively" from such a view, since "research planning would then be (reduced)

to the preplanning or foreseeable results. The consequence of such a view is that the unforeseeable, the fundamentally new idea, creativity in the highest degree would stand outside of planning...but if research planning practically remains limited to programming the foreseeable, in fact it organizes...the rear guard."¹³

It has been recognized in the GDR that, with the given economic and technical parameters in the scientific-technical plans, the best that could be expected is the achievement of "international average performance."¹⁴ Research and development projects which are built "on the basis of 'reliably' achievable solutions" transform average performance into the future and signify economic loss of prestige on the world market.¹⁵

IV. Misdirection and Lags in Microelectronics

Centralist systems easily fall prey to mismanagement. Indeed, within the system there are no sufficiently effective mechanisms to correct decisions that have once been made, if such decisions should prove to be misdirected. Since everything is directed towards the socially significant decisions in the leadership center of the SED and of the state organs controlled by it, the positive total development depends to a high degree on whether the central makes the right decisions at the right moment. But there are no guarantees for this, as becomes clear through the example of microelectronics in the GDR.

Microelectronic development is especially informative in this connection for two reasons: On the one hand, the economic faith of entire societies is decided in the medium term through this basic technology and through the ability to master it; on the other hand, in this area the GDR was no longer a novice already since the fifties. Noteworthy industrial potentials of the office machine industry such as the office machine plant in Soemmerda, today among other things the manufacturer of the first GDR personal computer, had indeed been taken over from the inheritance of the Third Reich. Thus, for example, in 1955 in the VEB Carl Zeiss Jena, a programmable computer of the first generation was successfully developed for the first time.¹⁶ Especially during the reform phase which began in 1963, with its pronounced orientation towards the unfolding of all the driving forces of the "scientific-technical revolution," considerable efforts were made to develop the microelectronic industry. However, with limited success: Already at the end of the Ulbricht era, the connection to the development of computers of the third generation (i.e. based on integrated circuits) had been lost.¹⁷ The equipment lag relative to the world standard at this time was already probably 3 to 4 years.

The decisive switch point for a course correction was only initiated in 1977, at the Sixth Central Committee Plenum of the SED, which now provided for the forced expansion of microelectronics. In the same year, the US manufacturer Commodore already offered for mass consumption a ready-made minicomputer with a computer, keyboard, monitor, and cassette drive. Already 6 years previously, one of the currently leading US manufacturers of microprocessors - Intel Company - succeeded in a sensational breakthrough: For the first time, the central unit of a computer was set up integrated on a single chip.¹⁸ To clarify the avalanche-like development of microelectronics which has been taking place since the middle of the seventies: Just in the Federal Republic of Germany, the

production value of the electronics branch from 1975 to 1980 rose by more than 25 percent to DM 4.4 billion.¹⁹

It is variously granted in the GDR that they underestimated the dynamics of this western development.²⁰ But this is scarcely convincing. Indeed, the general trends of technological development on the one hand had already been predicted long ago by the GDR scientists (at the block level), and in view of the expansion of the western electronics industry and its innovation tempo, these dynamics were clearly recognizable even to laymen. But a different explanation appears much more probable, namely the relative inertia and long reaction times of the centralized decision process. Precisely during the phase where basic new directions would have been necessary, they were concerned with quite different problems: Walter Ulbricht was replaced. Erich Honecker had to consolidate his own position of power and had to take the political initiative. With the Eighth Party Congress of the SED in 1971, a new strategy of social policy was introduced. The successes of the new eastern policy of the social-liberal federal government of that time forced the SED to adjust to a completely new position - a situation which Ulbricht had still tried to prevent.²¹ This unsatisfactory reaction (for the microelectronic industry continues to do business in "normal operation") led to considerable lags in a series of microelectronic production standards with respect to the development of the world market.

If one wishes to estimate these lags, the question arises concerning the criteria and furthermore concerning the information power of corresponding findings, which can turn out quite different depending on the comparison standards that are applied. Technological comparisons frequently refer to performance features of equipment. This has the advantage that certain use-value properties of a product are compared by technical parameters (mass, speed, accuracy, etc.). Such features are indeed an important criterion for estimating technological developments, but they always illuminate only one aspect of a technological reality which in truth is much more complex. For instance, the ability of a social system to generalize new information quickly is also important, that is to guarantee the diffusion of innovations. Furthermore, the social adaptability of a society of certain professional groups to technical transformation forms a decisive perspective of the general technological level.

Emmanuel Hesthene, for example, points out how, through a series of institutional and mental factors, the use of computerized learning machines, instruction in system analysis, etc. was effectively prevented in the USA towards the end of the sixties, although the equipment and curricular preconditions had already existed for a long time.²² A comparable situation is the one which was observed by the GDR economist Haustein in the middle of the eighties, during his investigation of rationalization measures in the industrial area: Existing potentialities of automated production preparation were not used, in fact, because the management cadres that are concentrated here were hostile to modern information technology. Missing knowledge in information science, lack of clarity concerning its economic and technological utility, but also "fright and video screen anxiety" - understandable especially among academics - here are more relevant to technological development levels than new presentations on the Leipzig Spring Fair.²³ For one to choose such social indicators as a comparison point, the GDR presumably would correspond to the

developmental level of the USA 10 years ago. Furthermore, if one makes comparisons in terms of equipment, such restrictions and reservations would sharpen one's view for the relativity of the information.

As a comparison area, we choose the sector of microcomputers, which is especially informative for the level of "electronification" of a society. Indeed, it is the microcomputer which first effects the transition to broad application of microelectronics. If the microelectronic revolution had taken place just in the area of large computer systems, the social and economic effect of electronification would presumably have remained limited sectorially. The small and increasingly powerful microcomputers opened up an immense broad application area for autonomous applications in small structures (i.e. applications independent of large EDP systems). These applications in particular gained flexibility, reaction power, and processing capacity. For 1986, a Diebold study suggests that 800,000 microcomputers will be sold just in the Federal Republic of Germany. For comparison: In 1985, altogether about 34,000 microcomputers were manufactured in the GDR. The total economic inventory at the beginning of 1986 probably was at best about 80,000 to 90,000 units.²⁴

By way of cautious estimate, the present equipment lag in the GDR in the sector of microcomputers, as compared to the production standards of leading western countries, amounts to 5 years or more. Differentiated level differences especially result from the circumstance that the western industrial states (including Japan) exhibit a heterogeneous picture in their technological development. But as a rule of thumb, one can say that the GDR technologically lags by more than one computer generation. Some typical features exhibit the following picture: The prevailing equipment standard for microcomputers in the GDR consist of 8-bit processors, such as were used in the Federal Republic of Germany in connection with the first personal computers at the beginning of the eighties, and such as even today are customary on western markets with simple devices such as hobby computers. But they scarcely still meet professional standards, since modern software products - whether for office automation or in the engineering area - presuppose processors with a word length of 16 bits and more.²⁵ Such processors replace the family of 8-bit devices since about 1982. In the GDR, a microcomputer with 16-bit processing width was presented at the Leipzig Spring Fair of 1985. One year before this, there was a corresponding processor already as a fair exhibit.²⁶ If one compares the personal computer from Soemmerda, which has likewise been available since 1984/85, with western products, its technical features (processor type, memory capacity, peripheral devices such as monitor, etc.) approximately correspond to those units that were available internationally since the beginning of the eighties.

In the area of memory chips a similar picture appears. 256 kilobit chips have been offered on western markets since 1984. Such very highly integrated memory components can accept, for example, up to 16 pages of a standard typewritten text (or a comparable number of characters). This again led to a considerable capacity expansion (with simultaneous miniaturization) for commercial microcomputers. More recent software products, such as, for example, professional text processing-, calculational-, or graphics-programs for example presuppose memory capacities that were presented in the GDR for the first time in the spring of 1985, with the new work station computer A 7100 (with a 16-bit

processor). According to press reports, the GDR combine VEB Microelectronics is supposed to mass produce 256 kilobit memory chips beginning in 1986. But this planning objective obviously was not achieved.²⁷ Here it is important to know that mass production precisely still presents considerable technological problems, and thus costs time. The successor product, the 1-megabit memory, has been available in the west as a laboratory product already since the end of 1984. But only since the beginning of this year is this chip being mass produced by IBM in Sindelfingen and in Burlington/USA. This will be the case in 1987 at the West German manufacturer Siemens. At this time, the latter enterprise is still testing mass production in trial runs.²⁸ If Erich Honecker could only recently admire the "structures of a megabit memory" through a microscope in the combine Carl-Zeiss Jena, this says very little taken by itself,²⁹ not even whether this involved prototypes suitable for production. At least, in the competitive combine Microelectronics in Erfurt, they are still busy mastering the technology of the precursor product.

V. Isolated Formation of Priorities and Disorganization

Under the dominating conditions of a long outmoded, mechanistic planning philosophy, which aims at determinable cause-effect relations, spontaneous adaptation and innovation processes are essentially excluded. But it is these processes which in a certain sense "maintain" the total system in all its component areas and in many ways. But it is precisely with elementary innovations that one cannot generally foresee how manifold the linkages with other systems are and to what remote effects these may lead.

To clarify this: For example, at the end of 1974, a computer module called "Altair" was for the first time offered to electronics enthusiasts in the USA in the magazine "Popular Electronics." At that time it could not be foreseen at all that this would be the moment of birth of the microcomputer.³⁰ Unexpectedly, within a few days a flood of mail orders arrived for the "Altair." And just as unforeseeable were spontaneous resonance and adaptation processes which created an entire infrastructure of social, communication, and economic interrelationships. Thus there quickly arose a market for accessories and for new, improved modules. The first computer stores were opened. The communication and information demands of a new group of consumers and manufacturers in a certain sense hung in the air. The magazine "Byte" was at that time the first popular technical journal for minicomputers. It utilized and organized this new demand profile with striking success. As Curnow and Curran write, a year later there were "at least 30,000 hobby computers and 300 computer stores in the USA; Byte ran an edition of 100,000 copies. Microcomputers had gained a foothold."³¹

This example clearly shows how problematical the directive planning strategies and control methods are, at least when complex innovation processes and their social propagation are involved. In fact, this infrastructure consisting of communication, service, manufacturer's offerings, and user needs, which mutually swung themselves higher and higher in a process of continuing creation of ideas and adaptation, should have been foreseen in its essential elements. Since this is unrealistic, only the controlling intervention form above remains, and this again leads to isolated priority determinations and linear planning procedures.

What results is the deceptive optics of all-through planability, which in reality fails on a continuous basis. As in the GDR, the consequences are the "thousand small things," which are continuously lacking: residential facilities without an adequate telephone network, automobile production without sufficient service facilities and spare parts, and domestically made computer systems without a correspondingly differentiated and qualitative demanding software supply.³² Precisely this latter aspect casts a characteristic searchlight on the disorganizing consequences of linear planning and control strategies. These can indeed set one-sided priorities but they can leave out of account the entire complex of mutually intermeshing complementary areas. The best computer production is useless if the corresponding software is lacking. Computers (hardware) without software are like record players without records.

The GDR is obviously lacking, in every respect, a well-developed infrastructure of specialized software producers, who are producing for general needs. Accordingly, every user of data processing devices - generally the combines and enterprises, large economic facilities, agencies, and the like - developed his own software inasmuch as he was able to do this.³³ The philosophy of improvisation demanded: Do it yourself. This necessarily led to the rapid creation of total confusion in home-made software products. Isolated parallel work was frequently done for identical applications. Every manufacturer produced for his own special need, while demanding standard software was not developed due to a lack of resources and the time expenditure associated therewith. Thus, in the area of office automation alone, there are 240 to 260 different software products for wage and salary processing (tailored for larger data processing systems and minicomputers). Generally these obviously involve simple programs which were developed for inhouse use. "More demanding solutions would often be lacking," according to the technical organ "Computer Technology and Data Processing."³⁴ EDP users with good personnel and equipment facilities can still help themselves in this situation by means of improvisation talent, although it would seem quite probable that here too the available hardware is used only insufficiently due to a lack of professional software.³⁵ But those who have to look into the "electron tube" here by dint of necessity, are all the small and medium users of standardized software, especially the single users of microcomputers which are not coupled to any central computer system. The use area here extends from agricultural production associations through the supply enterprises, smaller scientific facilities, up to the computer work station in the enterprise departments and - for the GDR at this time still the music of the future - up to private owners of personal computers.

This situation again has consequences for the entire communication process. The references to appropriately user-friendly directives (so-called "documentation" or "manuals") for software are so sparse in the technical publications that, in this area, the impression of a microelectronic third world country appears justified. Without detailed documentation, however, even experts in the material are scarcely able to use the software product adequately. As "New Germany" on the occasion of the Leipzig Fall Fair, was not slow to report, "consistent" work is being done on the hardware presuppositions to produce the 1-megabit memory chip.³⁶ But almost 10 years after the decisive Central Committee decision of 1977 there still exists a situation in which there is no time for the "proper documentation" of software.³⁷

VI. Defensive Behavioral Strategies and Informal Influences

Although democratic- centralist management structures are directed towards guaranteeing a rigid uniformity of will over the entire command pyramid, it is remarkable that they continuously generate its opposite: the loss of control capacity through contesting interests and interest levels.

The basic relationship between the managing and performing level is first of all based on an authority gradient: The managing organ has available relatively more positive or negative sanction capabilities for implementing its will than the performing organ. In the foreground, this constellation fulfills its intended purpose: The interest of subsidiary instances is directed one-sidedly to central prescriptions. Formal plan fulfillment is even in fact the all-decisive guiding variable for the political and technical carders in the enterprises, combines, and other institutions. But the same constellation simultaneously creates an undesired side effect: the defensive behavior of the performing organs with respect to the respective management instances.

In this sense, the economic units have a structurally based interest in minimizing their own performance, in reducing plan objectives, and in disposing without risk for the plan fulfillment process. The more complex the planning objectives turn out to be, and the longer the decision chain becomes, the more do the central organs operate with highly aggregated information from second hand. However, with all stages of the planning and management pyramid, this information is substantially stamped by the defensive behavioral strategies that are effective within this pyramid, and consequently is one-sided. In this way there arises a network of social mechanisms for security and for the limitation of performance, which extends from the enterprise microcosm through the combines up to the industrial ministries, ministries, and other central organs. The result is a remarkable phenomenon: Externally, in the formal management relationships, there arises the picture of a monolithically thoroughly organized structure; but more realistically, a texture of informally effective, manifold self-interests is active, which altogether seek for ways and means to shield their own functional area and to perform easily visualizable routine operations.

Naturally, this model structure in no way includes all the relevant interest structures within the planning and management world. The relationship of formal decision centralism and real splitting into isolated, defensive areas of interest is primarily important for the mode of operation of the economic subsystems and the subordinate state decision instances. This interest structure thus characterizes predominantly the behavior of persons exercising their function if responsible regulation of decision and decision conversion from planning and plan fulfillment are involved. Furthermore, these dominant layers of interest mix with an abundance of special interests of social groups. Within the activities of the economy, these represent partly parallel but also partly contrary interests. Precisely those who have a high interest in professional distinction, as individuals or social groups - ambitious managers, parts of the scientific-technical intelligence, success-oriented party functionaries, or workers with upward mobile ambitions - frequently find that their initiatives collide with the defensive inertial tendencies of the planning and management machinery. Their behavior generally causes unquiet and especially: they "spoil the prices."^{37a}

Consequently, basic innovation frequently represents only an awkward bother for the economic units. Over the long term, they introduce uncertainties into well-worn routine operating sequences, naturally lead to higher performance demands in subsequent planning periods, devalue their previous conventional performances and products and in addition conceal the risk of coming into arrears with current plan fulfillment.³⁸

This stamps the behavior of the economic units in their handling of the state planning tasks. For example, the minister for college and vocations schools in the GDR, Hans-Joachim Boehme, reported to the Tenth Central Committee Plenum (1985) that in 1984 a total of 1660 research results could be transferred from the universities and colleges to the combines, and of these 261 were tasks from the state plan for science and technology³⁹. But these data presumably have no particular informational value except for their legitimation function: Since plans were made so as to be fulfillable, there scarcely are any plans which are not fulfilled. The modesty of task definition was already calculated into the plan formulation for the science and technology plans or for the operative "specification manuals."⁴⁰ This already takes care that, "as much as possible, only development and research tasks will be included in the plan which can be successfully concluded with absolute certainty by the required date."⁴¹ About one-third of the tasks of the enterprise scientific and technical plans presumably is situated "below the international standard." Only 25 of the 222 social-science research topics, which were specified for the period 1981-1985 at Berlin's Humboldt University, were conceived as "top performances" according to the view of the responsible topic managers.⁴²

Since research and development processes are characterized by high complexity also contextually (and not only in evaluation, procedure, and organization etc.), there are no limits to the imagination when the point is to differentiate out individual contextual components, to specify details as projects, or to collect together old stock under a new perspective. From every scientific project, one can effortlessly construct several such transformations. Thus, in the industrial development area in the GDR enterprises, one does not hesitate if statistically and in one's material self-interest, the innovative balance must be improved. Harry Maier, until recently one of the leading GDR sociologists in the area of science and innovation theory, neutrally calls such procedures "cosmetic innovations."⁴³

On the creation side, the generation of new technical knowledge is an open, still uncircumscribed design. As regards its possible results it is therefore also highly risky; in its processual forms it is frequently spontaneous and indeterminate. In principle, this results in an unavoidable contradiction between the action conditions of creative spontaneity on the one hand and the operational conditions of administrative control on the other hand. The latter necessarily tend to transform risky creativity into a foreseeable and controllable process. If such tendencies succeed in establishing themselves, the result is that the creative and spontaneous components of the invention process are dissolved and are replaced by smoothly fitting routine actions. A scientist in the area of industrial research expressed the state of affairs as follows: "In this connection, I deem it much more important that the task definition does not already prescribe the solution path, but leaves sufficient room to the engineer for creativity by limiting itself to boundary and framework

conditions. The specification manual must therefore give the inventor sufficient intellectual space and must stimulate his imagination. Otherwise modest performances are preprogrammed."⁴⁴

The present form of party-state controls, however, require what the GDR sociologist Ladensack describes as follows: "In some cases, an understanding of the nature of risk and of the absolute necessity to enter justified risks must first of all be deepened further...For various people, management and control organs, risk in particular is a term with a negative content. If risk appears, plans to eliminate this risk are immediately demanded."⁴⁵

For the personnel of research and development areas, scientific institutions and the like, this tendency to eliminate risk and the associated conventionality of scientific-technical solutions also has deleterious motivational consequences. Indeed, precisely in this group of employees, the need for identification with the work and for independent performance is especially marked, as sociological investigations have all agreed in showing. The expectational stance of engineers is characteristic of this. As professional beginners, they start from the idea that their future activity must to a high degree exhibit creative components.⁴⁶ However, as sociological individual studies certify, "original solutions, unconventional modes of working, the solution of difficult problems," are largely meaningless for the material and social recognition of this intelligence group.⁴⁷ In individual studies, more than 55 percent of the personnel in research and development departments, see "only little" or "no" possibilities for creative activity in their work.⁴⁸ In view of these circumstances, such conditions must lead to identity conflicts and frustration experiences. The unattractiveness of a thoroughly routinized working world causes corresponding escape strategies in behavior and attitudes. Thus, the inadequate performance behavior of precisely the research and development personnel is frequently criticized. Instead of a clear performance orientation, there are decided trends to adjust oneself satisfactorily in the collegiality and in the satisfying social context of the research collective, as has been shown, for example, by the GDR sociologist Sailer.⁴⁹ If one relates such performance-indifferent behavioral forms to the likewise recognizable motivational patterns of this intelligence group, the conclusion lies close at hand that the performance deficits express not only a stress-free comfort but also the tendency of resigned adaptation.

VII. Innovation and the Price System

Actually the independently established self-interests of the economic units - their defensive practices - as well as the failed effects of the central list control apparatus to all intents and purposes would have to make a clear appearance also in terms of the business economy and the overall economy. However, this is not the case, or is the case only very conditionally. Differently than under market and competitive conditions, the economic units are not punished for inefficient production methods, for qualitatively deficient or technically outmoded products, by direct economic disadvantages, such as loss of market fraction, falling profits, or even ruin. Mismanagement, developmental disturbances, or the lack of adaptive processes rather become visible only after considerable time delay. The reasons for this are the special modes of operation of the economic control instrumentalism, especially the value and

price and categories, by means of which economic expenditures and yields can be measured and evaluated.⁵⁰

Prices and their informative power have forever been the Achilles' heel of the real-socialist planning systems. They represent the weak point of the central control mechanisms for all intents and purposes, since the major portion of the characteristic planning data, in terms of which the economic units orient themselves, is given in price expressions or (like profit, net production, and the like) is formed on the basis of prices. Now the prices do not reflect or reflect only incompletely the real expenditure structures and in particular the aspects of scarcity, quality, and technical level. Therefore, economic performances can be formally certified as profit increases and economic growth, although they conceal the truth of creeping loss of efficiency and falling growth.

Until today, the GDR has not succeeded in expressing the innovation factor adequately in its industrial enterprises. By innovation is understood the introduction of new products, processes, and performances. Naturally, extraordinarily complex problems of calculation and evaluation present themselves here. The new technical standards must be determined by complicated international comparisons just like the costs and the potential economic use. Finally, price formation would have to lead the result of providing an appropriate stimulus both for the manufacturer and for the buyer.

Every planning bureaucracy, no matter how powerful - in the GDR: the pricing office - and no matter how extended its control competencies, here must be immediately overstressed just for reasons of complexity. Just the current product and performance nomenclature in the GDR comprises about 80,000 different product items, which already represent collections. A leading machine construction enterprise, such as the combine for shaping technology, has available a product assortment of 130 machine types in nearly 1,000 variants. The product spectrum of the combine "EAW" (Electronic Apparatus Works), a central enterprise of automation and device technology with over 33,000 employees, even comprises about 50,000 products!

Thus, the currently valid calculational guideline for industrial prices does indeed determine that "economic efficiency must in principle be demonstrated for individual products" for product innovations which guarantee an extra profit only with a certain time limit.⁵¹ But this is obviously more easily said than done. The general growth of complexity and differentiatedness of economic processes generates a large number of functional decision margins (and thus also manipulation possibilities) on the subordinate levels, which are not amenable to any directorial control and monitoring. For the enterprises and combines it often appears to be the practice to demonstrate increases of use value in determining prices, where such increases are in truth fictitious or insignificant under technical and economical aspects.⁵² It is very probable that, for example by such apparent innovations in products, the characteristic planning figure of net production in the combines - which has been one of the main performance characteristics since 1961 or 1963 - is subject to considerably distortions. For with "new" products one can calculate higher prices (extra profits), can escape threatening price reductions because of outmoding, and can correspondingly overfulfill operational net production.⁵³

VIII. Microelectronics and Price Drops

One of the most important economic effects which emanates from the expansion of microelectronics is the devaluation of conventional technical systems and the rapid price drops of the corresponding products.

The severe competitive battles within the western electronics branch are carried out by using more and more novel technological knowledge. This leads to a previously unknown tempo in product innovation, in a cycle of 1 to 2 years. It implies dramatic loss of value for the respectively preceding product generations.

A powerful office computer in the middle of the eighties already fulfills the technical standards of a data processing system 10 years ago. The universal applicability of freely programmable microcomputers for every type of information processes already today is the basis for an applications area extending from machine tools to the automobile, from household appliances to industrial robots, not to speak of still more comprehensive applications of simpler microelectronic components. At the beginning of the eighties, it was estimated that about 5 percent of the 20,000 applications for microelectronics, which could be foreseen at this time, were already technically and economically accessible. This means that the spiral of ever-shortening innovation cycles, of a technologically expansive structural turnover, and of rapid potential devaluation will probably continue for the foreseeable future.

An economy such as that of the GDR is thus subject to a double pincer movement: On the one hand, due to its systemic innovational weakness, it is unable to sustain either the tempo or the technical standards of world market development; on the other hand, a progressive price reduction acts on its standard products and conventional potentials. With the broad scope of the effective microelectronics, this trend radiates out to the entire economy.⁵⁴

Those 256-kilobit memory chips, which were ready for mass production in 1986 in the microelectronics combine, brought a unit price of DM 150.00 when they were introduced in western markets in 1984. In 1985, their price level already had fallen to DM 9.00. As regards the 64-kilobit memory chips that have up to now been produced by this combine, the price sank from DM 150.00 (1979) to DM 3.00 (1985).⁵⁵ To put it bluntly: The microelectronic memories which the GDR can manufacture in 1986 are already worthless, measured by the international price level. Personal computers, such as the product from Soemmerda which has been available since 1985, used to cost about DM 10,000.00 with comparable technical features as a system (including monitor, printer, keyboard) at the beginning of the eighties. Already in 1986, such units as a system, depending on design, are available for DM 2,000.00 and even less. Even powerful professional microcomputers with 16-bit processors and high internal memory capacities, which are superior in terms of hardware to the comparable work station computer from Robotron (available since 1985), have been subject to price reductions up to 38 percent since the beginning of 1986!

Microelectronic development involves other economic branches. For example, this can be observed in the machine construction sector. Traditionally this area is an industrially highly developed domain of the GDR economy. Together with

vehicle construction, the machine construction sector makes up about one-fifth of the total industrial product of the GDR. Together with the chemical industry, which likewise is traditionally highly developed, it makes up altogether the most important industrial area. It is therefore of considerable economic significance, for example, that conventional products of machine construction have fallen to their lowest level in 30 years in terms of world market prices. Products such as tool machines without microelectronic equipment, especially without freely programmable controls, do not even fetch their simple manufacturing costs under the conditions of the world market.⁵⁶ At least in the key area of machine tool construction, only 30 percent of the products at the end of 1985 were determined in their functions "essentially" - whatever that may mean - by microelectronic units.⁵⁷ This would correspond approximately to the world market level of 1981. In other words: 70 percent of the products of this sector are presumably not salable on western markets or only with substantial losses. Figures concerning the international top position of the GDR as an exporter of machine tools (presumably at sixth place) are deceptive concerning the decisive fact that the major portion of this export goes into the CEMA area. Here the GDR, after the Soviet Union, is indeed the largest manufacturer of machine tools.

Such technologically conditioned devaluation processes raise basic questions concerning the real performance capability of the GDR economy. However, in the absence of data, one can only make educated guesses concerning this point. First of all, the assumption is probably appropriate that a considerable portion of economic growth, to which sectors such as machine construction and more recently the electronic industry have decisively contributed (compare Table 2) - measured by international price-performance development - de facto exists only on the patient paper of the central state management of statistics. However, despite the government foreign trade monopoly, these international market developments penetrate to the economic potential of the GDR, although with a time delay and indirectly (for instance by falling export opportunities or worsening terms of trade). This fact is no longer questioned even by the relevant specialists in the GDR. On the contrary: Realistic performance evaluations of the technical level of products and their economic use effect, as is recently being argued, are supposed to be especially their export chances and their use conditions on the (non-socialist) world market.⁵⁸

Table 2: Growth of Industrial Net Production in the Area of the Area of the Industrial Ministries⁵⁹

| Area | Data in % | | | | |
|--|-----------|------|------|------|------|
| | 1981 | 1982 | 1983 | 1984 | 1985 |
| Total | 7.0 | 5.6 | 7.1 | 8.3 | 9.0 |
| Among these: | | | | | |
| Chemical Industry | 8.0 | 9.2 | 10.1 | 9.2 | -- |
| Electrical Engineering/Electronics | 12.0 | 10.7 | 14.5 | 16.1 | 15.1 |
| Machine Tool Construction and Construction of Processing Machines | 14.0 | 9.6 | 6.4 | 9.0 | -- |
| General Construction of Machines, Agricultural Machines and Vehicles | 9.0 | 3.6 | 2.6 | 9.4 | -- |

IX. The Economization of Research

Since 1983 one has tried in the GDR, by a series of measures, to make the innovation process more efficient. These measures include especially the already mentioned "specification manuals" - which basically are nothing more than operational planning concepts for scientific-technical performances - and measures for the economization of research and development. An essential idea in connection with the latter consists in putting the purchase and sale of scientific-technical performance on a business and contractual basis. For this purpose, research potentials and comparable facilities have been converted to the principles of so-called economic accounting.⁶⁰ This means that these institutions, as independent economic units, should secure the self-financing of their costs and should achieve planned profits. Further regulations which were promulgated at the end of 1985 extend the basic principles of economic research work, directed by efficiency objectives, to the facilities of the Academy of Sciences and of the universities. Specific performance contracts and the financing of corresponding scientific performances by the combines in the future should form the central point of research in the academy and university area.⁶¹

Through various references in the technical literature, one can start from the idea that, up to now, commercial perspectives had a far subordinate role in the area of research and development.⁶² In the corresponding facilities one generally processed the prescriptions from the plans "Science and Technology" in terms of scientific-technical topics. Economic profit and loss calculations here formed a negligible quantity as an orientation point, since the users of scientific products - predominantly the economic units - on their part also did not possess effective profit criteria (even today do not possess them). Thus the question naturally arises whether the application of business accounting in research facilities will change anything as regards this lack of use orientation.

The donquixotterie of these most recent control measures already becomes apparent from the fact that business calculations can apply to research and

development facilities only as long as the overall economic system abides by the same principles. However, as long as such business criteria remain violated, act only with great distortion, or are completely ineffective among the enterprises and combines, there also is no compelling reason for departing from the previous practice in the research and development area. In cases of doubt, the pseudo innovations which are performed according to order, failed developments that are foreign to any need, and unsatisfactory technical performances will be accounted for to the last penny with great accounting skill.⁶³

According to all probability this measure may not even lead to improved cost transparency. Precisely in this area, the previous inadequacies of the pricing system produced their full effect. Indeed, the producers of research performances, as the ordinance specifies, should not calculate their costs and should form corresponding prices on this basis - with the addition of the normatively specified profit. The vendor and the buyer of the corresponding research performances must here agree contractually concerning the provisional cost and price limits. Top performances and the purposeful surpassing of requirements can even be honored with extra profits amounting to 50 percent or 100 percent of the normative profit. However, for the most part (70 percent) these remain at the disposition of the respective research facility. The personal utility for the research and development personnel remains strictly limited. Where applicable, it is financed through corresponding extra emoluments in an amount of up to 300.00 mark per employee, from the premium funds of the research facility. Beyond this, however, additional performance incentives can be allowed where needed. Among the staff members of the Academy of Sciences and among the universities, the top rate of all bonus payments at this time is 1,200.00 mark per full-time employee.⁶⁴

But in what do the justified costs of research performances consist? And how high is their economic use, which actually would have to be expressed in profit and extra profit additions? GDR publications justly also point out that such cost-use criteria provide only very limited information concerning the economic value and social significance of a scientific-technical innovation.⁶⁵ Precisely with research performances, if they do indeed deserve the name, what is generally involved are original productions for which by definition there are no comparisons. Cost calculations here calculate merely the individual effort, and nothing more. Their economic utility is again in no way derived from the expenditures incurred. For example, the technical capabilities of the research personnel are a decisive, non-quantifiable factor for the possible results. One von Helmholtz or Einstein does not correspond to 10 second-rate physicists - not even if the material expenditures for salaries, equipment, etc. were always to be the same. Furthermore, precisely in the area of research and development, there is no linear relationship between economic expenditure and profit. Useless research performances can swallow up considerable means, while relatively modest research expenditures can lead to results whose use possibilities stand in no relation to their original costs.

From a practical point of view, previous experience with "business-like accounting" in research facilities also have not led to any significant effects.⁶⁶ Since the buyers of scientific-technical performances generally can scarcely evaluate the justification of costs, and since the price specifications

have an administrative character, the research facilities will invoice whatever costs they incur and - somehow or other depending on motivation and interest - they will deliver what has been ordered.

X. Evaluation and Outlook

The structural innovation impediments obviously cannot be based on a single cause. Rather what appears is a combination of influential factors which mutually reinforce in their effect: The dominance and control system causes a structure of defensive behavioral strategies and interests. These again can establish themselves with growing intermeshing and differentiation of social processes through the mechanisms of the control instrumentariums. A constant circular process arises which continues on newer and newer stages like an upwards expanding spiral: The control system creates failures, the failures reproduce in dysfunctional practices, the system reacts with a repair policy at the control media - for example the economization of research - and the cycle begins anew.

In taking historical inventory, one could show that this functional relationship was already put in motion with the construction of centralist planning and management structures.⁶⁷ However, this will not be pursued further here. Rather, it is decisive that this deficient cycle now runs in a largely changed scenario of surrounding conditions, in a changed constellation, and thus produces a new quality. What still appeared enforceable without serious damage under the conditions of the fifties and sixties, because apparently only isolated economic sectors were afflicted, becomes a question of the very existence of the political system under the conditions of a technological and especially microelectronic revolution.

To secure dominance - independent of the character of the political order - has long ago become the question of utilizing scientific-technical resources. The constitutional expert Ernst Forsthoff already pointed out this circumstance at the beginning of the seventies.⁶⁸ The entire remainder of social existence conditions and future chances depends to a decisive degree on the capability of a system to accomplish this under comparatively optimal conditions: social well-being, loyalty of the population, necessary resources for domestic and foreign policy, the rank and influence of a society within the worldwide division of work. There can be no doubt that important scientists in the GDR and presumably also parts of the political leadership personnel are perfectly clear about these circumstances.⁶⁹ It is not least of all in this fact that there is a basis for powerful potential for social and institutional renewal: On the one hand, the political power elite, for the sake of its own survival chances, is under duress to adapt the political system to changed technological conditions. On the other hand, precisely in the area of the scientific-technical intelligentsia (but certainly not only there) there exists a comprehensive need for deliberation of innovative potentialities.⁷⁰

At any rate, there is a chance that an external structural pressure will join together with a more than mature idea - the reform of the political system, and that this juncture would have its numerous social proponents and interested beneficiaries. This is at least a possibility of future development, which the

present holds in readiness just like other possibilities. A second recognizable scenario, however, seems more probable in terms of the present state of affairs: the constitutional inability of the regime to reform.

The logic of structurally based innovation deficits requires that the starting point of every new design would have to consist of breaking through the dysfunctional relationship of the control system, reinforced interests, and control media, in its totality. However, there are no starting points for this in contemporary GDR discussion. On the contrary: What appears to be precisely typical is Erich Honecker's emphasis at the 10th Central Committee Meeting of the SED (1985) that nothing should be tampered with in the current system of central state planning and management.⁷¹ Still more massive signs were provided by the 11th Party Congress of the SED. Evidently with a side glance of the risk of contagion from the Gorbatschow reform discussion - it quite expressly set down a structurally conservative policy of preserving the status quo, and it emphasized the accomplishments of previous development.⁷²

Is one therefore struck with blindness and is the innovation crisis therefore inevitable? It lies close at hand, in a centralistically encrusted regime, rather to exhaust oneself in the everyday use of the well-worn dominance machinery than to accept the risk of a basic reform of the institutional system.

FOOTNOTES

1. As regards the data given compare Neues Deutschland (New Germany) of 30 Dec 1985 p 3, and: Intensification of Research, Conditions, Factors, Problems (author collective), Berlin (East) 1984, p 158.
2. Compare: Economic and social effectiveness of scientific-technical progress (author collective) Berlin (East) 1986 p 260.
3. Our own calculations: Statistical Yearbook of the GDR 1985, Berlin (East) 1985; various volumes of "Einheit" (Unity) and "Neues Deutschland" (New Germany).
4. Marie-Luise Fiebertorn, Some problems of age-specific features of the performance behavior among research and development carders in industry, in: Information on Sociological Research in the German Democratic Republic (cited below as : SID), 19 (1983) 6, p 51.
5. Guenther Boring (conference report), scientific meeting on the "Problems of the political-ideological leadership of scientific-technical progress," in: SID, 21 (1985) 3, p 61.
7. Socialist Economy, manual, Berlin (East) 1983, p 132.
8. W. I. Lenin, The Next Tasks of Soviet Power, in: Selected Works, Volume II, Berlin (East) 1970, p 763; concerning the present self-understanding in the GDR compare for instance: Management of the Socialist Economy. Teaching Manual, Berlin (East) 1983, p 40 ff.

9. Compare Frederic Vester, *The Biocybernetic Sensitivity Model. A method for adequately dealing with and planning cybernetic systems*, in: *Technical Consequences and Social Confirmation*, Cologne 1981, p 225 ff; a popular scientific discussion can be found in *Neuland des Denkens (New Territories of Thought)* Munich 1984, here especially Chapters 1 and 2; in the GDR the cybernetic discussion began primarily under the influence of the fundamental papers by Georg Klaus. His first book, *Cybernetics From a Philosophic Perspective*, Berlin (East), already appeared in 1961. Cybernetic ideas especially stamped the conceptions during the time of economic reforms in the sixties. With Honecker's access to power in 1971, cybernetic concepts were banned from the official management and planning doctrine.
10. Georg Brunner here speaks appropriately of "Competence Competency" of the leading communistic party. Compare his study: *Political Sociology in the USSR*, Part II, p 188.
11. Compare Guenter Lauterbach, *Technical Progress and Innovation*, Erlangen 1982, p 44 ff.
12. Compare *Intensification of Research* (footnote 1), p 309 ff and *passim*.
13. *Ibid*, p 308.
14. Gundula Barsch, *Stimulation and Performance Behavior*, in: *SID* 19 (1983) 5, p 33.
15. Heinz Grosser/Cornelia Zanger, *Specification Manual and Performance Evaluation in Research and Development*, in: *Sozialistische Arbeitswissenschaft (Socialist Labor Science)* 28 (1984) 6, p 407.
16. In this connection compare the extensive study by Klaus Krakat, *The Path to the Third Generation. EDP Development in the GDR Until the Beginning of the Seventies*, in: *FS-Analyses* (1976) 7.
17. *Ibid*, p 53 ff.
18. General historical, technological, and social-economic relationships of microelectronics in the meantime have become available in a multiplicity of specialized and popular-scientific references, and will no longer be specially cited here. The following studies with an introductory or manual character should be especially mentioned: *For Wheel and Woe. Microelectronics and Society*, Hamburg 1984; Stefan M. Gergely, *Microelectronics*, Munich 1985; Ray Curnow/Susan Curran, *The Rororo Computer Book*, Hamburg, 1985.
19. Cited after Ulrich Briefs, *Information Technological Development and the Future of Work and Unions*, in: *WSI Reports*, (1986) 3, p 251.
20. Compare for instance Rudolf Heinze, *Greater Flexibility for Production - an Important Precondition for Increasing Performance*, in: *Press Informations*, Berlin (East) (1983) 149, p 2.

21. In this connection compare the compelling analysis by Ernst Richert, between independence and dependence. The Interaction Between Society and Foreign Policy in the GDR, in: Deutschland Archiv (Germany Archive), 7 (1974) 9, p 972 ff.
22. Compare Emmanuel G. Messtene, Technological Change. Its Impact on Man and Society, Cambridge (Mass.) 1970, p 21 ff.
23. Heinz-Dieter Haustein, Time Factor and Efficiency in the Phase of Production Preparation, in: Wirtschaftswissenschaft (Economic Science) 32 (1983) 2, p 203.
24. Compare Gerhard Merkel, Microelectronics - a Challenge to Every Combine, in: Einheit (Unity) 41 (1986) 6, p 517.
25. For a brief explanation: Until the beginning of the eighties, 8-bit processors were the industrial standard. 8-bit (or 1 byte) here means that the processor can process "words" 8 bits long, that is a pattern consisting of 8 characters (either "0" or "1"). With an 8-bit pattern one obtains 256 (namely 2^8) different combinatorial possibilities of these 8 bits. More possibilities thus cannot be designated in this configuration (i.e. in a fixed sequence coded by "0" and "1"). Thus the processor also knows only 256 codes in order to execute instructions, e.g. representation of a letter, storing of data, arithmetic operations, etc. Instructions are generally composed of more than one "word", and the number of different instructions which the processor can recognize and process is correspondingly reduced. With currently already available microcomputers, having a 32-bit word length, the performance capability of a small computer facility is already reached. Processors with a 16-bit word length belong to the average level for professional purposes.
26. Compare Rechentechnik und Datenverarbeitung (Computer Technology and Data Processing)(below called: R&D), 22 (1985) 5, p 26 f, and Klaus Krakat, Technological Progress by Electrical Engineering and Electronics, in: FS Analyses (1984) 6, p 81.
27. Neues Deutschland (New Germany) of 16 January 1986, p 3. Compare also: Journey to the Other Germany, Reinbek at Hamburg, 1986, p 87.
28. Compare Axel Hacke in: Sueddeutsche Zeitung (South German Paper) of 28 May 1986, p 3.
29. R&D, 23 (1986) 7, p 2.
30. Compare Ray Curnow/Susan Curran, The Rororo Computer Book, Hamburg 1985, p 126.
31. Ibid, p 127.
32. This aspect is frequently mentioned in the GDR literature itself. Compare for instance Helmut Koziolok, Economic Strategy, Scientific-Technical Progress, and Greater Efficiency of Mathematics and Computer Technology for

the Effectiveness of Science in the GDR, in: *Wirtschaftswissenschaft (Economic Science)* 31 (1983) 2, p 176 f; Gerhard Trautenhahn, Microelectronics as Catalyst of Scientific-Technical Progress, in: *Einheit (Unity)* 40 (1985) 2, p 139 f.

33. Compare Questions of Software Utilization, in: *R&D*, 23 (1986) 1, p 9ff.
34. Ibid, p 10.
35. Compare New Tasks for Organization and Data Processing in the Formation of Combines, in: *R&D*, 20 (1983) 3, p 18ff; Eberhard Prager/Evelyn Richter, The Information-Processing Technology and its Utilization, in: *Einheit (Unity)* 38 (1983) 9, p 887.
36. *Neues Deutschland (New Germany)* of 1 Sep 1986, p 3.
37. *R&D* (footnote 33) p 10.
- 37a. Compare Werner Gilde, *The Path to Success. Experience, Thoughts, Advice*, Leipzig 1985.
38. Compare Heinz-Dieter Haustein (Remark 23) p 205 f; see also Angela Scherzinger, Aspects of Planning Research and Development in the GDR, in: *Quarterly Journal for Economic Research* (1983) 1, p 83.
39. Compare *Neues Deutschland (New Germany)* of 22/23 June 1985 p 5.
40. The specification-manual ordinance has existed since 1982 (and already previously in similar regulations). It specifies certain principles and binding modes of procedure for the planning and management of research and development tasks. The economic use effect, task definition, deadlines, time sequence, etc. for corresponding projects are prescribed therein. Specification manuals are then used to steer, control, and keep account of research and development work.
41. Claudia Grafe/Dieter Liebing/Harry Nick/Heinz Willems, The Management of Scientific-Technical Progress in the Combines, in: *Einheit (Unit)* 39 (1984) 5 p 413.
42. Intensification of Research (footnote 1) p 207.
43. *Innovation and Science* (author collective), Berlin (East), 1985, p 26 and p 53.
44. Heerke Hummel, A Free Margin for Inventions, in: *der neuerer (The Innovator)* 34 (1985) 2, p 31.
45. Claus Ladensack, Specifications Manual and Risk, in: *der neuerer (The Innovator)* 33 (1984) 8, p 98.
46. Compare Otto Braun, Conference Paper, in: Guenter Boring (footnote 5) p 38 f.

47. Gundula Barsch (footnote 14) p 33.
48. Compare Joerg Roemer, The Technical Creative Work of the Constructor, in: *der neuerer (The Innovator)* 33 (1984) 5/6, p 66.
49. Compare Sybille Sailer, Initial Results of a Case Study on the Relationship of Collective Standards and Management Behavior in Research and Development Collectives, in: *SID*, 19 (1983) 5, p 27 ff.
50. On this point compare the various papers of Manfred Melzer concerning the pricing system in the GDR. Concerning the Problems of Price Formation and its Systematic Weaknesses: Manfred Melzer, Price Planning and Price Policy in the GDR, in: *Price Problems in the GDR*, Erlangen, 1980, p 113 ff, and (together with Kurt Erdmann) *ibid.*, p 151 ff.
51. *GBI.d.GDR* 1983, T.1, p 341 ff, in conjunction with the changes according to *GBI.d.GDR* 1985, T.1, p 377 ff, here p 378.
52. Compare Rudi Weidauer/Albert Wetzel, Successful Management of Combines, Berlin (East) 1981, p 218; compare also Guenter Lauterbach, Price Formation and Technical Progress, in: *Pricing Problems in the GDR* (Remark 50), p 25f and p 36. Despite various changes in the details of price formation, the explanations of Lauterbach (relative to the 1976-80 5-year planning period) still apply even today.
53. Compare DIW Weekly Report (1985) 5, p 55, processed by Doris Cornelsen.
54. Compare *Innovation and Science* (Remark 43), p 23 ff.
55. Compare *Die Zeit* (Time), No. 32/1986, p 17.
56. Compare Harry Maier, Strategy Formation Under the Conditions of the Scientific-Technical Revolution - Problems of Increasing the Contribution of Basic Research Towards an Increase of Innovation Power in the National Economy, in: *Wirtschaftswissenschaft (Economic Science)* 32 (1984) 11, p 1618 f.
57. According to specification from the Ministry for Machine Tool Construction and Processing Machine Construction in the GDR, Rudi Georgi, in: *Press Information*, Berlin (East), No. 111/1985, p 2.
58. Compare economic and social effectiveness of scientific-technical progress (Remark 2), p 273 f.
59. Our own calculations according to index numbers according to the *Statistical Yearbook of the GDR* 1985, Berlin (East) 1985, P 138.
60. Compare *GBI.d.GDR* 1983, T.1, p 387 ff.
61. Compare *GBI.d.GDR* 1986, T.1, p 9 ff and p 12 ff.

62. Compare for instance Gerhard Rosenkranz/Hans-Gerd Bannasch, Innovation Organization in Industrial Enterprises, in: Arbeit und Arbeitsrecht (Labor and Labor Law) 40 (1985) 3, p 51 and passim.
63. Compare Guenter Mittag, Preparation of the XIth Party Congress With the Highest Performances, in: Einheit (Unity) 40 (1985) 6, p 491.
64. Compare GBl.d.GDR 1986, T.1, p 18.
65. Compare Economic and Social Effectiveness of Scientific-Technical Progress (footnote 2), p 251 ff and p 276 f.
66. Compare Helga Engel, Increasing the Economic Effectiveness of Science and Technology by Using Business-like Accounting in the Research Facilities of Industrial Combines, in: Wirtschaftswissenschaft (Economic Science) 34 (1986) 5, p 711 and p 715 ff.
67. Compare Fred Klinger, Statics and Dynamics in the GDR, in: Foreign Policy and History, B 46-47/85, p 29f.
68. Ernst Forsthoff, The State in Industrial Society, Munich 1971, p 42 ff.
69. Compare for instance Otto Reinhold, Intensively Expanded Reproduction - a Revolutionary Process, in: Einheit (Unity) 38 (1983) 8, p 722 and passim.
70. In this connection compare Gert-Joachim Glaessner, The Scientific-Technical Revolution - Intelligence - Policy in the GDR. Paper at the XIXth GDR Research Meeting in 1986; soon to appear in the edition of German Archives as a conference volume "Tradition and Progress in the GDR."
71. Compare Neues Deutschland (New Germany) of 21 June 1985, p 4.
72. Compare Hartmut Zimmermann, Internal-Political Aspects of the XIth Party Congress of the SED, in: GDR Report (1986) 5/6, p 286.

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SUPERCONDUCTIVE RESEARCH WELL ADVANCED AT USP

Rev. de Janeiro MANDEI in Portuguese 13 Jun 87 pp 36-45

[Article by Derval Ferreira: "Superconductors, Brazil in the Race of the Future"]

[Text] More than ever the São Paulo slogan "Non ducor, ducor" [I am not led, I lead] is justified in the pioneer work that is being done in the USP [São Paulo University]

Operating in their research with equipment that reproduces the cold of space of Zero Kelvin or absolute zero--which is minus 273 degrees Centigrade--and with other equipment that produces high temperatures above 1,000 degrees Centigrade (Photo), scientists of the Institute of the Physics of Materials of the USP have enrolled Brazil in the club of those who have managed to produce the technological miracle of superconductivity. They made the first superconductor materials at the same time that scientists of the developed nations announced their mastery of these techniques. For the first time, in science, Brazil is accompanying the development of a leading edge technology, at which much is expected, from the pole position. It appears with the promise of revolutionizing other technologies, creating a new world in which trains levitate, or producing nuclear fusion like that of the burning sun.

It was a race for the Nobel Prize, said scientists who were at the agitated meeting of the American Society of Physics at the Hotel Hilton in New York when the discoveries obtained in the field of superconductors were announced.

Using that picture of competition, it can be said that in that world scientific marathon featuring the technology of superconductivity, which had the participation of physicists from the most famous American, European and Asian research centers, Brazil is among the first to arrive at the starting line. It is the greatest news of the decade. Although in other fields of competition, where muscles are worth more than cerebral neurons, as in soccer, basketball and volleyball, our strength wavers on the eve of an Olympic, the performance of Brazilian physicists is no less than exemplary.

that is, to arrive at a practical and cheap application compatible with conventional applications. It was necessary, therefore, to find other cheaper and less cold means for obtaining it, whether with new materials or original processes.

When the starting gun was fired for the marathon, scientists of the Institute of the Physics of Materials started at the same time as their European, American, Japanese and Chinese colleagues. The objective was that of finding new fusions of materials so as to manage to raise the space temperature from Zero Kelvin to others more manageable and practical. New metallic fusions and new processes could clear the land hidden in profound darkness. The only light visible at that time, lit the starting point discovered by Onnes: At extreme levels of cold, metal loses all resistance to the passage of electricity. Electrons join and move rhythmically, without collisions, thus allowing the flow of electric current without any losses.

Moreover, there was the possibility that with superconductivity it would be possible to produce powerful magnetic fields, and because of these fields, there could be levitation by magnets and superconductive materials which would repel each other with enough force to lift elephants.

The truth is that in another unit of the ultralow temperature laboratories, that of dilution cooling, the team of Physicist Armando Paduan Filho, repeated the phenomenon of ultratemperature at 10 millikelvin, absolute zero or minus 273 degrees centigrade, with liquid helium many times. In other units, advances were also significant. Other teams had produced a superconductive coil of niobium and titanium, also cooled with helium gas. The coil creates magnetic fields like those created by the coils developed by the Japanese and which are being used in the prototype of the Maglev train, the train that levitates at high speeds on the magnetic fields of its roadbed.

The great Brazilian leap began actually during a pleasant chat between two physicists of the USP. Carlos Castilla Becerra, assistant professor at the institute and researcher in low temperature magnetism, was exchanging ideas with his colleague Spero Penha Morato, Ph.D., of the Fine Chemistry and Rare Earth Department of another institute of the USP, that of Nuclear Energy Research--IPEN. From that talk there emerged the request by Becerra to his colleague for a new material for experiments in superconductivity at higher temperatures, that could be produced by nitrogen gas, which is cheap and very easy to obtain.

Spero Penha Morato and his team hurled themselves into the task. After 4 lines they arrived at the synthesis of compounds through refining and fractionation of rare earth oxides, which resulted in a superconductive ceramic made of yttrium, barium, copper and oxygen, etc. according to the formula reproduced for MANCHESTER in the illustration of this article: yttrium, barium-2, copper-1 and oxygen 6.5. Together with researcher colleague Sonia Licia Baldacchi of the Synthesis Laboratory, they worked day and night on the superconductive ceramic, not with low temperature equipment, but with melting furnaces at 970 degrees of centigrade. Little

The background of that exceptional performance resides in the training of human resources, advanced equipment and technologies that explain why and how Brazil arrived at superconductors at the same time as the powers in techniques and sciences.

Among developing countries, few possess research and development centers so prepared for activity in that area as are the low temperature laboratories and those of fine chemistry of the Institute of the Physics and Materials of the University of Sao Paulo.

In addition to top notch personnel and the aforementioned sophisticated equipment, Physicist Giorgio Frossatti, one of the greatest names in the fields of cryogenics and superconductivity, worked in the laboratories for many years--he still works there, but sporadically. It is due to that reputation that he holds the position today that only belonged to Heike Kamerlingh Onnes, considered the father of superconductivity, in a university in Holland. Frossatti was, and is, one of the many physicists who did research at the side of Brazilians. In addition to him, researchers of the Massachusetts Institute of Technology, the famous MIT, also came to Sao Paulo to carry out experiments, using the equipment of the laboratories.

The initial point of technological development is at the Cryogenics Laboratory installed by Professor Carlos Quadros, a world renowned specialist in the sector, after teaching in past years at Harvard University in the United States. In the laboratory, the liquefaction of helium is done, a very expensive gas produced by few countries. Its high cost is explained by the special technologies required for its extraction from oil wells, where it is found deposited in rock together with petroleum. It is with liquid helium that the absolute zero cold is achieved, the minus 273 degrees centigrade or zero Kelvin. At that level of cold, in 1911, the Netherlander Onnes for the first time attained the phenomenon of superconductivity in metal alloys.

For 70 years, more or less, the subject remained frozen, that is, it was known how to produce superconductivity but with costs for obtaining it discouraged any investor, even an official one.

It was something like discovering something and then learning just what it was good for. However, when other technologists began to imagine that with superconductors there could be magnetic trains that fly over the magnetic mattresses, electric automobiles driven by magnets that use magnetic fields that would give them a range well beyond that of conventional gasoline engines, tomographies by magnets, transmitters for mobile phones that were more effective, or the transmission of electric power for great distances with a zero loss of electricity, the subject began to thaw. It was taken out of hibernation (as it was) at a slow pace.

From the beginning it was evident that the way to achieve superconductivity at zero Kelvin would involve an attempt at creating a new type of superconductors that would be able to work at higher temperatures.

by little they arrived at the ideal compound that Professor Becerra wanted. With the ceramic obtained, both ran to submerge it in liquid nitrogen at a minus 196 degrees centigrade, which was kept in an inoffensive, household thermos bottle such as those used for keeping coffee hot, easy to handle, transport and store. Cooled to that temperature, the ceramic then demonstrated the phenomenon that became known as "Meissner effect," that is, it acquired properties of repulsion and, as a result, the property of levitation.

Spero, Sonia and the other researchers of the team managed to kill two birds with one stone: They obtained a superconductive ceramic and cooled it with nitrogen instead of helium. It is the same nitrogen, cheap and abundant, that the White Martins Company provides to Brazilian cattlemen for the preservation of bovine semen for their artificial insemination operations in remote ranches, as far away as the high tension line towers that bring electricity from the hydroelectric plants to the cities, thus demonstrating that the application of nitrogen in superconductors of electricity will not be a problem of great proportions. No one can deny that there are reasons for the researchers to celebrate the triumph in grand style. It is a triumph that will lead to others in the sectors of superconductor technology.

Professor Becerra can already exhibit a small superconductive coil today, made of niobium and titanium; it is compact, of the size of an ordinary flashlight battery, which uses a minimum amount of current, enough to keep the external copper wire charged so that it can be connected to the electric outlet, but which is capable of generating an extraordinary magnetic field. In another laboratory of the institute, that of large magnetic fields, where it is possible to make measurements that are extremely sensitive to the ambient temperature, the new superconductive coil is being tested. A magnetic field twice as large as the field created by one of the conventional electromagnets there was measured around it. These magnets produce a magnetism of up to 20,000 Gauss (the magnetic field of the earth is half a Gauss), requiring a power supply of 5 to 10 kilowatts, while the superconductive coil produces 40,000 Gauss.

On the basis of extreme cold, Brazilian scientists are beginning to find hotter things that high technology promises for improving the lives of all of us. In the laboratory of magnetic materials of the IPEN, high performance magnetic products are being researched and developed for subsequent manufacturing on an industrial scale of permanent magnets based on alloys of neodymium, iron and boron, raw materials that are plentiful in Brazil.

Also being developed in that laboratory is a project of amorphous strips based on cobalt. These are alloys of high magnetic permeability, and they have produced strips 12mm long, which have not yet been produced in other laboratories. These are destined for the production of recording heads for the disk drive tape recorders of computers, magnetic shielding and magnetic sensors in general for the electroelectronic industry. As in all the other laboratories of the Institute of the Physics of Materials, the equipment used was developed and manufactured by the USP itself. With respect

to the amorphous strips, their preparation is also the result of own research and development. The alloys are melted and cooled immediately, obtaining in that process of rapid transition between cold and hot the amorphous state that confers on them magnetic properties that are higher than those of conventional crystalline materials.

Superconductivity, after all, is really something super. When new technologies of the Institute of the Physics of Materials can be passed on to private enterprise or state enterprises, we also can think about trains that run at hundreds of kilometers per hour, floating along on beds of magnetic fields. We can also begin to think about large magnetic chambers for storing electricity without losses for moving automobiles, since we already have the technology for their manufacture; an electric automobile built in Rio Claro, S.P., the "Gurgel," is proof of that. The most immediate application in Brazil, according to what everything indicates, is the transmission of electricity at long distances with superconductors. In that way the commercial exploitation of the gigantic water-power potentials of the Amazon Region could be made possible, carrying electricity with zero losses to the industrialized south or to other countries. In other nuclear power plants, we can imagine reactors without irradiation by means of the nuclear fusion system (what takes place in our sun and the stars), instead of dangerous radioactive nuclear fission.

The Brazilian data processing industry will be another area that will feel the impact of the superconductor revolution. Faster machines could be made with them. With the absence of heat, more circuits could be put into one chip and more chips into a smaller space, without the need for ventilation to compensate for the generation of heat. As a result, it will be possible to manufacture a microcomputer that is as fast and efficient as the large computers of the present. Magnetic resonance tomographs such as those now at the Albert Einstein Hospital of Sao Paulo, more powerful and cheaper, will be made available to the people in the medical centers of the country. Actually, with the conquests made in the USP, one can think (and imagine) everything that fiction writers imagine (and think) for our day to day reality.

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CSO: 3342/135

BRAZIL BIOTECHNOLOGY SECRETARIAT, POLICY ESTABLISHED

Duesseldorf HANDELSBLATT in German 5-6 June 87 p 12

[Article by vwd: "Sarney Wants to Protect Domestic Market--New Guidelines for Biotechnology--Government Fears Controversy"]

[Text] Rio de Janeiro, Thursday 4 June 1987--Brazil has issued policy guidelines for the field of biotechnology. However, according to Brazil's Minister of Science and Technology Renato Archer, the regulations, which have been approved by President Jose Sarney, have not been published to date because the government fears that they may trigger "new controversies." In an interview with the IPS news syndicate, Archer would not deny rumors that a sort of "set-aside" is planned for the domestic market, similar to the measures in effect for the protection of the Brazilian computer industry.

About 2 months ago Brazil quietly established a special Biotechnology Secretariat, which is to be responsible for implementing policy in that area. Archer indicated that the proposed "law for a reserved market" is to be more flexible than the rules protecting the computer industry. Inasmuch as biotechnology covers a wide range of areas, he said, the government does not wish to make limitations stringent enough to risk having the country fall behind in the "areas of scientific technology."

Observers interpret this to mean that the government wishes to close the market only in those fields where domestic research and Brazilian industry are already quite active, such as in the production of bioalcohol as a fuel, a part of the national alcohol program. Brazilian researchers also claim significant progress in the area of seed improvement. In this context, they mention the 65 million metric ton record grain crop expected this year.

Inquiries at the new government agency indicate that in the field of biotechnology \$13-14 million is being spent for research and production in the Brazilian domestic market. Eighty percent of this amount is allotted to state-owned enterprises. According to Archer, Brazilian authorities firmly believe that a predominantly agricultural nation like Brazil must develop its own biotechnology.

The restraint in publishing the guidelines indicates that the government wishes to avoid "new confrontations in the biotechnology area," after the problems it had with the United States in data processing (computers, etc). However, some fear has been expressed by members of several biotechnological research centers that barriers to the Brazilian market would lead to difficulties in the exchange of scientific information and in gaining access to research results obtained in foreign countries.

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STATE OF BRAZILIAN MACHINE TOOL INDUSTRY

Sao Paulo MAQUINAS E METAIS in Portuguese Mar 87 pp 16-26

[Text] While the entire Brazilian society is waiting for at least a sign that the country's economy will develop, the machine sector has shown with numerical data that its market is heading toward a state of anemia. The captains of industry are attempting to curb the pernicious process that has caused the thermometer of their sales to point to a disturbing cool-off; and hence they are waiting for the pertinent authorities to do their part.

It is an uncertain time. The directions that the industry may take are unpredictable (at least as of the time that this edition of MM was receiving the final touches). The industrial pace has been hard hit by the recessive syndrome and also by a crisis of pessimism. Estevam Koenigsfeld, director of Panambra, remarked: "I believe that the cooling of the economy is due largely to psychological factors and to those of the market per se," citing the possibility of a recession: "If called, it will come."

The months of January and February are traditionally considered "weak," both by industry and commerce. Nevertheless, industrial production during January of this year exceeded that of the same period in 1986 by 6.1 percent. However, it so happens that these monthly rates have been dropping; because, during that month, the figure was nearly 17 percent growth over September 1985.

In the view of most businessmen this does not represent any anomaly in market terms, because the stocks in stores began to enlarge in September, aimed at meeting the demand at the year's end. On the other hand, many think that the first quarter of 1987 was not so much harmed with the so-called renewal of commercial stocks; which has maintained the pace of production in the industry.

However, those are data that fail to represent or indicate the level of industrial cooling. Thus, the capital goods sector might to some extent show the performance of a future global market, since it is the first to feel the effects of a crisis and the last to emerge from it.

"We are at a time of very great suspense, which is turning into pessimism. The economic data still do not allow anyone to conclude that the country is already

in recession. Obviously, the high inflation rates and extremely high interest rates, added to the problem of the exchange suffocation that the country is undergoing, have ended up creating very great suspense. If those problems are not properly settled soon, we may reach recession." This statement was made by Luiz Carlos Delben Leite, president of Abimaq (Brazilian Association of Machine and Equipment Industry); but he himself stresses that indicators for January pointed to a 0.3 percent rise in the employment level.

The director of Abimaq's own National Machine Tool Department, Newton de Mello, shows greater concern. "The euphoria of 1986 has now ended. Currently, it remains to be seen how marked the decline in the market will be. This is a difficult prediction to make at present, mainly because many purchasing firms are maintaining their investment programs, while others are postponing them," he noted.

He claimed that most of the large and medium-sized companies are maintaining their investment plans. On the other hand, there are businessmen who think twice before making any investment, because at a time of doubt, they prefer to invest in the financial market, and not purchase capital goods; for by so doing they procure a much faster return.

Engineer Hicao Misawa, of Romi Industries, claims: "The return to the financial and non-productive investor is unquestionably an indicator of the decline in investment in capital goods. To date, I have no numerical data to prove it, but I think that the trend is toward a decline in sales compared with 1986; a year, however, that no one should forget as being atypical."

He claimed that many Romi clients are in doubt, but others, such as those with export commitments, for example, which they will have to keep, have no way of withdrawing.

He asserts: "Anyone who has medium and long-term investment plans is investing. However, companies making very short-term plans which are, moreover, virtually without a deadline, will undoubtedly reflect more carefully."

Operating in the field of special machines and tooling centers, B. Grob of Brazil is a little more pessimistic: "To date, we have not felt the real intensity of the recession, or even whether it is a tendency. This depends on the government's decisions. The financial market is still more interesting than producing, and hence many projects will be reconsidered. If the situation continues to be cloudy, the rain will surely come," comments Wolf Guenter Mueller, Grob's commercial manager.

The consultations with Grob are continuing, although a certain amount of idle capacity has already been spotted by clients. Mueller stresses: "We think that the machines which we are delivering now are not so necessary for the purchaser

as at the time of the order, and that we may soon be facing a recession. In this field, it is difficult to tell accurately when the orders began to shrink, mainly because they do not involve serialized goods. However, taking the number of consultations as a reference, there was a very slight decline starting in September, as the Grob manager reported.

An Eclectic Year

The capital goods sector began to revive beginning in the second half of 1984, caused indirectly by exports of manufactures. During all of 1985, recovery increased, reaching an average of 20.5 percent compared with 1984, on the whole.

Concurrently, inflation was galloping, and the government was divided. There was a split that became an abyss among the parties and, so as not to topple its structure, the government had to make a bridge, built quickly. The Cruzado Plan came into existence, curbing hyperinflation and discouraging financial speculation.

March 1986 became a month of discussion, particularly in connection with the deflator index of 7 or 14 percent.

Vagner Davanzo, assistant on the Remansa board of directors, and Sao Paulo representative of Index, Engrenasa, Wotan, Thyssen & Bonelli Grinders, and Bosch Roughing Tools, recalls: "Starting last April, the market was enthusiastic; then there began the search to meet the demand repressed since 1981, which at that time exceeded all predictions."

Mueller, from Grob, remembers: "When the Economic Stabilization Plan was announced, we had a halt in business because of the suspense generated at first, and later clients appeared, some unshelving projects and others seeking replacement and modernization of the manufacturing equipment."

Hicao, from Romi, which works with serialized machinery, recalls that the market became overtly a purchaser thirsting for a volume of machines which he claims no manufacturer was prepared to provide promptly.

The Advancement of Terms

The demand for machinery reached unanticipated levels. At the National Machine Fair in March 1986, the euphoria of both the visitors and the exhibitors was in evidence.

For example, Traub increased its terms threefold for automatic lathes, which could be delivered in 6 months at the beginning of 1986, but for which 18 months were being demanded by December. In the case of the CN lathes, the increase was ninefold, to 15 months, not such a large expansion, mainly because the demand for machines with numerical control was already intense even before the Cruzado Plan.

Davanzo, from Remansa, says that, at the end of last year, "many clients were buying machines on terms exceeding 18 months, some to guarantee their machinery."

Mello remarks: "There was a rather sizable extension of the delivery term because of the time lag between the increase in production and that in sales. However, this average term has now been reduced to a more normal threshold, namely, from 4 to 6 months."

He adds that, in the case of special machines, and machine tools on order, the time interval between the order and the delivery is always longer. He claims: "These are machines that have to be designed and built especially for each client; hence, as a rule, the terms exceed 12 months. This is a result of the type of product, and not of how the market is behaving."

The Grob manager, for his part, emphasizes: "Even before the cruzado, our terms were increasing. Last year, they expanded from 8 months to over 24."

The extension of the terms has caused many companies to import certain machines again. Internally, it was also felt that the explosion of the demand for consumer goods required an immediate response from the industries. So, in addition to importing, they resorted to used machinery.

In the used machinery sector, the behavior was similar to that on the used car market, whose prices rose sky-high, exceeding the prices for new ones.

However, for many firms, it was not conventional machines that could resolve the situation. This caused many to resort to the foreign market.

The president of Abimaq confirms the fact that, "Despite all the effort made by the industry to meet the market's needs, the demand remained at high thresholds, which ultimately caused an extension of the delivery terms." This extension also occurred on the international market in a manner more or less compatible with individual features for certain clients, with but few exceptions, particularly insofar as machines with greater specialization were concerned.

This afforded an opening for business firms interested in imports, whether it be because they belonged to foreign groups, or because they had interests linked with foreign groups, to join together to form a lobby the main purpose of which would be to bring the largest possible number of machines into the country.

However, when a comparison was made between the delivery terms on the domestic market and on the foreign market, it was noted that they were equivalent and, therefore, there was no reason for importing. Delben observes: "Now when it involves a machine that has a national similar one, and the similar one that I mention is one giving service with regard to terms, price, and quality, which are the three basic rules for establishing the principle of similarity, there is no reason to import equipment." He adds that, if this is done, one is, in fact, curtailing the growth of national business.

He claims: "When one talks about used machinery, the situation really becomes complicated, because to import a machine because it has been deactivated in its

country of origin on the basis of its technological obsolescence, in fact means wanting to doom the importing country to technological obsolescence, to a higher inflation based on the low productivity of that equipment, and to a loss of competitiveness on the international market; not to mention the fact that, in importing a used machine, there are serious difficulties in establishing its real value and, therefore, in attaining the proper tax charge."

Many imports are made through BEFLEX (Financial Benefit for Import and Export). They involve projects wherein the Brazilian manufacturer assumes the commitment, within a period of from 5 to 10 years, to export a certain amount and, in return, receives from the government permission to import components and machinery, meeting certain requirements, including that regarding similar products.

One BEFLEX project that deserves comment is that of Fiat Automobiles, which needed to import nearly all the machinery and equipment in order to make the production of one model of a vehicle, also intended for export, viable within a short time. Davanzo, from Remansa, claims: "This BEFLEX, in addition to all the tools, included certain machines that were also supplied by national manufacturers, but in much smaller quantities. I am sincere when I say that, in this instance, the law on similarity lost a little support, and the large companies need to reflect more when it is time to import. This is a battle in Abimaq, in defense of national manufacturers; and we want our space."

Destabilization

The overall growth in the sector during 1966 was 14.5 percent and, while significant, it was less than in the previous year. The Abimaq president stresses: "Last year's growth index was not great because of restrictive factors that the sector faced, such as irregularity in the supply and lack of raw materials and components, especially in the second half, and becoming worse during the last quarter of the year."

Davanzo makes a correction: "In September, we began having problems with premiums, and supplies, and there was yet another problem, namely, the change in the payment conditions. In other words, the terms of 30 or 60 days for payment were eliminated. Furthermore, for equipment or machine parts purchased from third parties, the previous rule for advance payment, which had been 30 percent, was changed to 50 percent; which reflected directly on the manufacturers' costs."

Grob's Mueller maintains: "We have no problems with supplies because, by paying the surcharge, we procure components, systems, and materials, with but few exceptions. This was a serious problem, since we produce machinery on order, and we were often left waiting from 2 to 3 months without receiving anything; and since we can only bill after delivery, it is in our interest to deliver the machine to the client as promptly as possible. In this way, we must absorb virtually all the surcharges while at the same time we cannot impose any increase outside the initial contract, mainly because we abide by the freeze and the client would not consent."

What also became common was the complete lack of delivery planning, forcing many to purchase their components, not directly from the manufacturer, but on the market, through resellers who, of course, have different prices.

Hicao, from Romi, comments: "During this period, the volume of rejected materials and components increased. The quality control had to be more refined and, in many instances, we had to wait for a new shipment. On the other hand, our terms had to be extended."

The Personnel Shortage

One major difficulty for the sector in 1986 was in hiring labor. The Romi manager remarks: "To deal with the growing volume of orders we needed specialized labor. However, procuring it was a real marathon, because some of the personnel laid off during the last crisis had become relocated in the economy, in other activities not in this field." He added that, as a result, wages began rising independently of the government indexes; since the supply of personnel was smaller than the demand. Furthermore, the rotation of labor increased, generating a wage spiral.

Abimaq's Delben explains: "Many lathe operators became taxi drivers, tool-makers set up their bars; in short, most of the workers have relocated. This labor dispersed because the crisis that struck us in 1982 and 1983 was very severe. For example, the machine tool sector even operated with 85 percent idle capacity."

Mello, from the Machine Tool Department, also cites the problem: "In September of last year we had average wage hikes of between 30 and 70 percent. Industrial employment itself made hiring employees a real auction." He claims that in the effort to raise production, the industries had to raise their internal wage level as well, because it was impossible to hire new employees earning more than the old ones performing the same job.

Realignment

The payment of premiums and the rising cost of labor caused the profitability of the sector as a whole to decline with the passage of months.

A survey made by the Abimaq Machine Tool Department shows that, during November and December 1986, and January of this year alone, there was an average cost rise of 35.2 percent.

According to the department head, by October the cost of components had risen an average of 22.5 percent. "Thereafter, these prices underwent an explosion. So, adding both amounts (22.5 and 35.2 percent), we have a really sizable increment."

At this point it would be well to recall that seriated machine tools had an official realignment granted by the Special Secretariat of Supply and Prices, amounting to 19.15 percent.

Mello complains: "This realignment was granted to us on 17 December 1986, however, it resulted from a request by us made just after 31 October; in

other words, a request based on the rise in costs which had stood at 22.5 percent, and we were granted only 19.15 percent."

He claims that this lucky break in December left a gap of slightly over 3 percent. However, a survey made by his department showed that, at the end of January, it had already reached at least 45 percent.

It so happened that, at the beginning of February, the sector became included in the second article of the CIP's [Interministerial Price Council] regulations, which states that the goods produced would be subject to the system for price accompaniment, and not price control.

This prompts the belief that there is a possibility of recovering the losses and gaps that have been claimed. But the outcome may not be so fortunate.

The head of the Machine Tool Department claims: "The major problem is the orders on hand, contracted with the prices frozen or readjusted by only 19.15 percent. We have no legal backing to change the prices of these machines." It should be stressed that, as of the close of this issue, no government document or regulations had been published authorizing the readjustment based on the variation in the LBC [Central Bank Note] for contracts involving under 12 months.

Delben observes: "I think that, within a few days, we shall have some authorization of this kind, because this is a factor pressuring the sector greatly, and hampering the marketing of products with contracts based on delivery terms in this category."

According to Mello, the 6-month term represents a relatively large portfolio, if analyzed as the mean term of the machine tool sector. He explains: "This represents at least 1.5 billion cruzados per month. So, to meet those orders, the sector will have to face very serious damage, and hence there will be a need for renegotiation."

Some polls taken by him indicate that there is a certain predisposition for reviewing such contracts which (Mello stresses) were made based on certain conditions wherein an inflationary performance such as the present one was not anticipated. Moreover, there was a legislation preventing any change in price, also barring the introduction of clauses containing methods of readjustment into the contract.

Grob's Mueller claims: "We are trying to renegotiate with our clients based on the orders on hand, because they were signed anticipating stability in the economy. The manufacturer of seriated operating machines doesn't face so many difficulties in discussing their realignment. However, when one produces a capital good on order the negotiation is delicate, because it involves a machine intended for an application or family of parts, and for a particular client and specific manufacturing layout. So, if this client doesn't accept the readjustment index, there is no way for the manufacturer to stock that system or sell it to another client. We are left almost with our hands tied."

Another concern has arisen based on the time lag caused by inflation and the destruction of the companies' profit and circulating capital. At Grob, these signs have been clear for some time; so much so that the company decided to halt the expansion work on its factory. Mueller comments: "We also feel that the payments are not being made so religiously, because everyone is trying to maintain circulating capital through a financial market."

The assistant on the Remansa board also warns: "If the machine manufacturer doesn't succeed in renegotiating these contracts with his clients on real bases, he will lose the capacity to reinvest in his production and in technology."

Moratorium

Shortly before 1 year of the Cruzado Plan had been completed, President Jose Sarney appeared on the screen to report that Brazil had just stopped the payment of interest on the foreign debt for an indefinite time.

With exchange reserves declining as a result of the sharp drop in the trade balance surplus, a measure was required to prevent going into the hole. For a country which had been issuing annual interest of nearly 10 percent of the total value of the foreign debt to foreign creditors, Brazil was beginning to assume a new stance.

Bruno Nardini Feola, president of Nardini Industries comments: "For Brazil to be able to import the basic equipment, it requires cash, and this could start coming into existence if it would curtail the interest payments and continue exporting." While admitting the implications of this moratorium in the area of external financing, he shows a certain amount of optimism.

According to Nardini, the society's profile has changed, and a new letter of intent to the International Monetary Fund appears unlikely, or at least is at risk now. The businessman remarks: "There is no political backing for the implementation of a plan restricting domestic consumption based on IMF's rules. There are many businessmen defending this alternative, but I view it with great reservations; because it is a two-edged sword, and an even greater loss of wage purchasing power could lead to uncontrollable reactions."

Abimaq's Delhen supplements by noting: "The renegotiation of the foreign debt should be carried out so that it will make the fulfillment thereof possible, on real bases, without causing the people to suffer hunger."

Apart from the positions on and the way of renegotiating the debt, the fact is that the country needs cash, and for this, it requires exporting, on the one hand, and curbing imports, on the other. However, in the view of many this method is no guarantee, by itself alone, of the maintenance of the employment rate; and development of the domestic market is also required.

During a first phase, Brazil began curbing imports, which caused concern among all those who rely on imported products in one way or another.

Since the ordering of the moratorium, Abimaq has been meeting with CACEX [Foreign Trade Department] and with certain ministers, in an attempt to prove that the sector is strategic and cannot suffer very deep cuts in its imports.

It may be observed, with the restriction on the issuance of import permits by CACEX, that the industrial automation sector, for example, is strategic at present.

Guenter Mueller warns: "There is a concern at Grob, and I think among all capital goods producers, over the restrictions on imports. We have a high rate of nationalization, but we depend on some components whose scale or specialization do not warrant their production in Brazil. It so happens that nearly all of machines now leave the factory with numerical control and programmable controllers; and if we have no guaranteed supply in this area, we could stop our line and, hence, those of many clients."

Karlheinz Meister, from Traub, argues: "If the requests for imported components to CACEX are not met, we shall have problems very soon, because they stem from orders on hand. In the first place, this could lead to a delay in the deliveries, and, later, to a stoppage of certain lines. Nationalization could still be a solution for certain components, but this is becoming increasingly difficult; because the technological level of some of them requires the incorporation of fine components and machines considerably more sophisticated than in the past."

Although the industrial automation systems already show an initial nationalization, they rely on many microelectronic components not yet produced in the country, and this is a problem that is affecting the computer field as a whole in the same way.

However, the secretary of the Ministry of Science and Technology, Arnaldo Coutinho, gave assurance that there will be no supply problems in this field, because the government is attempting to prioritize sectors which rely on imports. This assurance seems to have greatly calmed the president of Abimaq, Luis Carlos Delben, who does not fail to note that the capital goods sector is strategic, because it is a multiplier of consumer goods. He declares: "We produce the machine that will produce the consumer good, and the latter will supply the internal or external market; in the latter instance, there is a generation of foreign currency enabling the country to achieve equilibrium in its balance of payments."

The machinery currently exported by Brazil is essentially conventional, and Nardini and Romi are the two companies that have been prominent on the international market, particularly in the United States.

Nardini comments: "At a recent meeting with German importers, I noticed in them a firm predisposition toward continuing the business. The United States created restrictions on the entry of Japanese and Korean machinery; however, this has not yet happened in the case of Brazil." Obviously, the restrictions on

Brazilian machinery have not yet occurred because this is conventional equipment the American counterparts of which have very high prices. The Japanese and Korean machinery contains innovations, such as advanced controls, with a very attractive price, competing in the same niche as the American manufacturers themselves.

However, it should not be forgotten that exports of Brazilian machinery are limited to the value exported in 1985. So, if Bant, for example, decided to triple its exports to the United States, exceeding the 1985 volume, there would have to be a revision of the position. In short, Brazil cannot export more conventional machinery than it is exporting now, at least to the Americans.

Newton de Mello comments: "We in the machine tool sector have a marked decline in exports, basically because of an exchange curtailment; which causes our products to become less competitive abroad. After the Cruzado Plan, this curbing of the exchange rate began to have a drastic effect in this regard. The government is apparently now adopting measures to correct this, because the recent devaluations and mini-devaluations on a daily basis have been significant."

Meister, from Traub, stresses: "At present, we are exporting model A15/A25 automatic lathes all over the world, because we at Traub are currently the only ones licensed for this type of machine. Nevertheless, we are exporting, or rather, opening a market for machines with numerical control in certain Latin American countries."

Exports have come to account for nearly 10 percent of the company's billing, but Meister is bent on expanding this portion. He is doing something almost pioneering, namely, exporting CN (numerical control) machines with the aggravating factor of the cost of national controls.

Furthermore, it is herein that the greatest area of friction among CN manufacturers and machine producers lies. In March, the interim executive secretary of SEI [Special Secretariat of Computers], Jose Eral Veiga da Rocha, announced that he would hold meetings with the national CN manufacturers to assess the reasons for such a high cost of the systems. The secretary proved to be quite determined to clear up this problem for once and for all; one which in fact is a power struggle between CN manufacturers and users, the outcome of which is difficult to predict. Apart from this, SEI seems willing to carry out its intentions, and has the backing of the Ministry of Science and Technology from the standpoint of making the reduction of industrial automation costs viable as quickly as possible.

Industrial Automation as a Solution

Even with non-competitive costs on the international market, many manufacturers are now content with a good performance of manufactured goods exports. Romena's Davanzo emphasizes: "The companies that want to export and be competitive will have to invest in technology."

He claims that the growth has been in geometric progression, and there is no way of stopping the production of machines with CN, stressing: "Wein, for example, has over 80 percent of its billing based on these machines."

Hicao, from Romi, recalls: "Even during the recent crisis, the growth continued on an exponential curve, and it is still rising." He gives a reminder, however, that the producers of Brazilian manufactured goods must be as able as their competitors, declaring: "Exporting is a war, in which both sides have to fight with at least the same type of weapon."

The trend toward using numerical control appears irreversible. The machine producers themselves have shown this when they started installing it in their production line, and when they actually saw that its use guarantees gains from the standpoint of quality, cost streamlining, and flexibility.

Hicao explains: "The current demand for machinery with numerical control is due partially to the ease of moving from one batch to another, the simplicity of the programming, and the more suitable tooling. For example, the machine can be quickly prepared several times for different parts and in increasingly smaller batches."

In this way, stocks can be greatly reduced, and their financial cost is high. Romi's plans are more ambitious, including the adoption of a "just-in-time" that allows the part to emerge from the machine and be sent to the assembly line.

Indefinite Picture

Traub's Meiser claims: "The year 1986 was marked by the overheated demand. I have no crystal ball, but I'm sure that the market for machines with numerical control must continue to grow, regardless of the cooling of the economy." He claims to trust in the investments devoted to leading technology. On the other hand, he believes in a decline or, as he preferred to call it, "a return to more realistic production thresholds" for his automatic lathes.

Since this equipment has now come to account for over 30 percent of the company's billing, Meister does not show so much concern over a possible recession. In addition, he has all his production taken this year.

Davanzo, from Remansa, who represents manufacturers whose delivery term still stands at 15 months, ventures to say: "I think that we'll remain at a threshold of from 20 to 30 percent lower than that recorded in 1986 in terms of sales; which is still very good, considering the excessive growth last year." He observes: "This cooling of the economy may reduce those terms, given the rescaling of production lines."

Delben warns: "The situation is not yet discouraging, but we need to make the government aware that we should not experience again a recession on the levels of 1982/1984, when we even operated with only 15 percent of our capacity."

Romi's Hicao is optimistic about this. "The country's vegetative growth itself will force a natural growth. There is indeed a crisis, but it is not eternal. In 1982, the market halted, but from 1985 onward it began moving again. The

pace may decline a little in 1987, but there is also the possibility of a come-back in 1988. After all, when there is a crisis, the meeting of needs is delayed; however, when there is a come-back, this is offset, which means that the market will grow, on the average."

Meister thinks: "Crises have always existed and always will exist; and each one teaches something; but no crisis ever resembles the previous one. They always have different features, and hence the responses from businessmen should also be varying."

He claims that many businessmen adopted certain measures during the last crisis, such as the adjustment of the personnel level based on their requirements; in some instances, the sale of part of their holdings so as to have circulating capital; and the elimination of the so-called "fat"; in short, they did everything that they had to do but one thing: invest in technological innovations. "Current measures per se may perhaps be sufficient to reach the next wave and rise up with the heightening of the market demand. However, if we had a crisis with the prolongation of 1981/1984, it is possible that many would not survive unless they now introduce a new program to supply the market, but not in conventional manner, rather in a diversified way, aimed toward the future; in other words, new technologies. Anyone who disregards this will have problems, and will be carried along by the next decline."

Bruno Nardini, who does not expect another recession at the 1981/1984 levels, summarizes by saying: "The businessman has suddenly discovered that the fact that he has not invested in his company during that recession period, or has applied his funds on the financial market or on things other than production, when it is time for a recovery of the economy, will have caused him to be caught 'short.'"

A merely market-oriented and traditional analysis today could bring about mistakes (he explains), because the society's profile is different. Apart from this, it is his opinion that the application of the FND (National Development Fund) resources could generate a certain amount of movement on the market, although indirectly; in addition to which, "The number of orders on hand, the non-cancellation of most of those orders, and the industries' concern for investing may bring a new encouragement to the businessmen in the sector."

It should also be considered that the machine tools sector's billing last year increased 23 percent; while the increase in sales amounted to 59 percent. For example, last year the Special Financing Agency (FINAME) of BNDES (National Economic and Social Development Bank) released 16,550,578.00 cruzados, and it plans to release at least 28,318,400.00 cruzados. During the first 2 months of 1987, there was an 87.9 percent increase in the number of outlays, in comparison with the same period in 1986. This, too, could maintain the investment level.

On the other hand, wages have been eroded by inflation, although the trigger device has been an inhibiting factor. The lion's bite of the income tax has also contributed to that erosion, as have the widespread price hikes.

Commerce and industry are already feeling the effects of this, while the government is preparing a plan and everyone is still in suspense. Certain measures, such as the extension of the financing terms and the release of 15 billion cruzados to small and medium-sized business firms, have attempted to slow down the cooling which, in turn, is difficult to quantify.

(1) **FINANCIAMENTO APROVADO POR CLASSE DE EQUIPAMENTO**

| TIPO/APLICAÇÃO DO EQUIPAMENTO (2) | (3) 1985 VALOR FINANCIADO | | (3) 1986 VALOR FINANCIADO | | (5) CRESCIMENTO REAL % |
|--|------------------------------|-----|------------------------------|------|------------------------------|
| | (4) Cz\$ mil | % | (4) Cz\$ mil | % | |
| 1 - Máquinas-ferramenta para trabalhar metais (6) | 436.720 | 4,7 | 3.138.831 | 11,9 | 240,9 |
| 2 - Máquinas para fabricação de artefatos de plástico (7) | 220.680 | 2,4 | 1.654.110 | 6,3 | 255,5 |
| 3 - Fornos elétricos industriais e de laboratório, máquinas de solda e de tratamento térmico (8) | 146.121 | 1,6 | 514.665 | 1,9 | 67,1 |
| 4 - Elevadores, guindastes, pontes rolantes, transportadores, etc (9) | 316.884 | 3,4 | 916.250 | 3,5 | 37,1 |

Fonte: FINAME (10) (11) ref.: Jan a Dez/86

Key to Chart 1:

1. Financing approved by type of equipment
2. Equipment type/application
3. Amount financed
4. Thousands of cruzados
5. Real increase
6. Machine tools for metal-working
7. Machines for manufacturing plastic articles
8. Industrial and laboratory electric furnaces, welding and heat treatment machines
9. Elevators, derricks, traveling cranes, conveyors, etc.
10. Source: Machinery and Equipment Financing Fund
11. Ref.: Jan to Dec/86

(1)

| Finame — Liberações 1985/1986 | | | | |
|-------------------------------|-------------------------|------------|-------------------|-----------------|
| Programa (2) | (3) Realizado Jan/Dez * | | (4) Crescimento % | |
| | 1985 | 1986 | Nominal | ORTN/OTN (5) |
| PME | 528 034 | 3 586 109 | 579,1 | 221,1 |
| PLP | 2 857 676 | 8 356 081 | 192,4 | 35,6 |
| Especial (6) | 2 113 019 | 4 594 708 | 117,4 | 1,5 |
| Conserve (7) | 32 833 | 13 680 | (58,3) | (78,6) |
| Total | 5 531 562 | 16 550 578 | 199,2 | 39,1 |

(*) Valores em Cz\$ mil (8)

Key to Chart 2:

1. Machinery and Equipment Financing Fund - Outlays
2. Program
3. Made Jan/Dec
4. % increase
5. National Treasury Readjustable Bonds/National Treasury Bonds
6. Special
7. Reserve
8. Amounts in thousands of cruzados

(1)

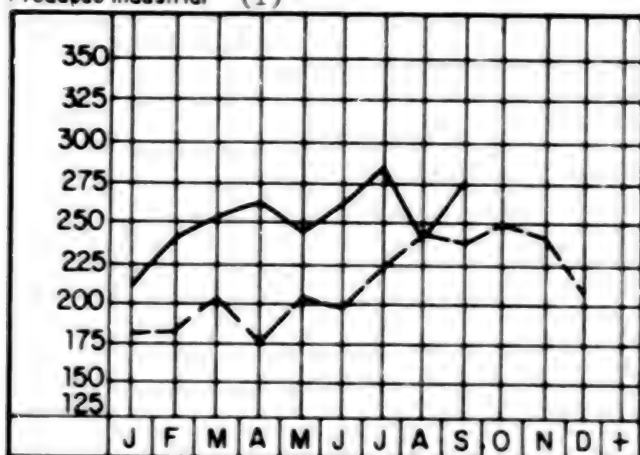
| Deferimentos 1985 1986 | | | | | | | |
|------------------------|-------------------------|------------|-------------------|----------|--------------------------|--------|------------------|
| (2) Programa | (3) Realizado Jan/Dez * | | (4) Crescimento % | | (5) Realizado Jan/Dez ** | | Crescimento % |
| | 1985 | 1986 | Nominal | ORTN/OTN | 1985 | 1986 | |
| PME | 736 216 | 7 086 368 | 862,5 | 366,9 | 4 439 | 20 597 | 364,0 |
| PLP | 4 048 044 | 12 657 582 | 212,7 | 44,3 | 14 018 | 23 523 | 67,8 |
| Especial (5) | 4 470 615 | 6 657 642 | 48,9 | (27,3) | 934 | 1 003 | 7,4 |
| Conserve (6) | 33 588 | 17 509 | (47,9) | (84,0) | 41 | 12 | (70,7) |
| Total | 9 288 463 | 26 419 101 | 184,4 | 34,9 | 19 432 | 45 135 | 132,3 |

(7) (*) Valores em Cz\$ mil (**) Numero de Operações (8)

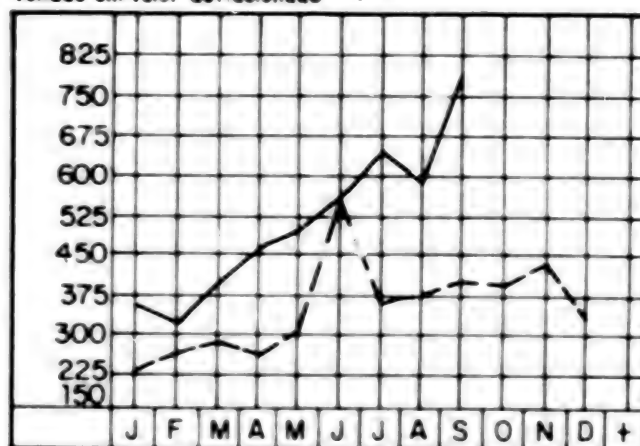
Key to Chart 3:

- | | |
|-----------------|-------------------------------------|
| 1. Grants | 5. Special |
| 2. Program | 6. Reserve |
| 3. Made Jan/Dec | 7. Amounts in thousands of cruzados |
| 4. % increase | 8. Number of transactions |

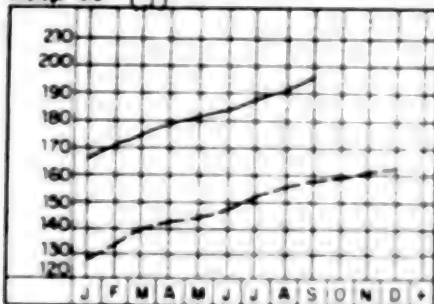
Produção Industrial (1)



Vendas em valor deflacionado (2)



Emprego Total (3)



Key to Graphs 1, 2, 3:

1. Industrial production
2. Sales in deflated value
3. Total employment

| (1) Especificação | (2) Ns índices básicos | | | | | |
|---|------------------------|-------|--------------|-------|------------------|--------------|
| | Valores (1) (3) | | | | (4) Variação (%) | |
| | mensal (5) | | média de (7) | | mensal (5) | média de (7) |
| | set. (6) | | jan/set. (8) | | set. (6) | jan/set. (8) |
| | 1985 | 1986 | 1985 | 1986 | 1986/85 | 1986/85 (3) |
| (9) 2.1 - Máquinas-ferramenta | | | | | | |
| Emprego total (10) | 158,0 | 196,8 | 145,6 | 181,8 | 24,6 | 24,9 |
| Produção industrial (2) (11) | 238,9 | 278,9 | 206,1 | 254,0 | 16,7 | 23,2 |
| Vendas deflacionadas (3) (12) | 405,0 | 800,8 | 339,5 | 516,2 | 97,7 | 52,0 |
| (13) 2.2 - Máquinas e implementos agropecuarios | | | | | | |
| Emprego total (10) | 187,6 | 246,8 | 182,5 | 218,2 | 31,6 | 19,6 |
| Produção industrial (2) (11) | 178,7 | 241,9 | 174,7 | 212,1 | 35,4 | 21,4 |
| Vendas deflacionadas (3) (12) | 191,7 | 329,6 | 153,1 | 223,5 | 71,9 | 46,0 |
| (14) 2.3 - Máquinas têxteis | | | | | | |
| Emprego total (10) | 97,0 | 126,5 | 88,3 | 116,6 | 30,4 | 32,0 |
| Produção industrial (2) (11) | 105,8 | 139,2 | 95,5 | 125,6 | 31,6 | 31,5 |
| Vendas deflacionadas (3) (12) | 180,8 | 278,1 | 140,9 | 231,5 | 54,0 | 64,3 |
| (15) 2.4 - Mecânica pesada | | | | | | |
| Emprego total (10) | 159,4 | 165,8 | 152,2 | 165,0 | 4,0 | 8,4 |
| Produção industrial (2) (11) | 145,1 | 143,4 | 137,1 | 143,8 | -1,2 | 4,9 |
| Vendas deflacionadas (3) (12) | 163,7 | 168,0 | 128,0 | 152,7 | 2,6 | 19,3 |
| (16) 2.5 - Máquinas gráficas | | | | | | |
| Emprego total (10) | 96,9 | 139,0 | 80,1 | 116,8 | 60,0 | 45,8 |
| Horas trab. na produção (17) | 72,7 | 125,9 | 64,1 | 99,0 | 73,2 | 54,4 |
| Vendas deflacionadas (3) (12) | 125,1 | 319,7 | 103,3 | 232,7 | 155,6 | 125,3 |
| (18) 2.6 - Máquinas para artigos de plástico | | | | | | |
| Emprego total (10) | 112,1 | 141,7 | 105,4 | 129,0 | 26,4 | 22,4 |
| Horas trab. na produção (17) | 97,9 | 123,4 | 90,1 | 106,4 | 26,0 | 18,1 |
| Vendas deflacionadas (3) (12) | 108,0 | 177,9 | 86,3 | 141,3 | 64,7 | 63,7 |

- (19) Fonte - DEE/ABIMAQ-SINDIMAQ - APE/SF. - Set/86
- (20) Notas - 1. Dados preliminares. (21)
2. Amostra: indústrias pesquisadas no Estado de S. Paulo. (22)
- (23) (1) Os itens 2.1 e 2.4 têm como base (valor 100) a média de 1972;
- (24) Os itens 2.5 e 2.6, respectivamente, janeiro de 1975 e janeiro de 1978.
- (25) (2) Vide chamada (2) da tabela 1.
- (26) (3) Deflator utilizado: IPA na ind. mec. (col. 34 - base modificada - da revista Conjuntura Econômica - FGV).
- (27) (4) Deflator: IPA na indústria mecânica (col. 35 - base modificada - da revista Conjuntura Econômica - FGV).

Key to Chart 4:

1. Specification
2. Basic index numbers
3. Amounts
4. Variation
5. Monthly
6. Sep
7. Average of
8. Jan/Sep
9. Machine tools
10. Total employment
11. Industrial production
12. Deflated sales
13. Agricultural-livestock machines and implements
14. Textile machines
15. Heavy machinery
16. Graphic machines
17. Hours working on production
18. Machines for plastic items
19. Source
20. Notes
21. Preliminary data
22. Sample: industries research in state of Sao Paulo
23. Items 2.1 to 2.4 are based on (value 100) average for 1972
24. Items 2.5 and 2.6, respectively, January 1975 and January 1976
25. See note (2) on Chart 1
26. Deflator used: Wholesale Price Index in the machine industry (Col. 34 - modified base - of the magazine CONJUNTURA ECONOMICA - Getulio Vargas Foundation
27. Deflator: Wholesale Price Index in the machine industry (Col. 35 - modified base - of the magazine CONJUNTURA ECONOMICA - Getulio Vargas Foundation

2909

CSO: 3699/70

ARGENTINE S&T SECRETARY SPONSORS BILL TO AID R&D

Buenos Aires INFORME INDUSTRIAL in Spanish Mar 87 pp 58, 59

[Text] The Ministry of Education and Justice sent to the National Congress a bill "aimed at promoting development and technological innovation in the production sectors for the purpose of generating and incorporating national technology into the production of goods and services."

The bill, which was drafted by the Secretariat of Science and Technology, establishes a system of tax incentives to promote national technological development, and proposes "to articulate two clearly complementary objectives: to encourage the production sectors to invest in technology development and improvement activities, and to support the specialized centers and laboratories that comprise the national scientific-technological system, so that they can contribute better to the needs of local production."

To promote the dissemination of this initiative, we are publishing the complete text of the bill:

Article 1. This law is aimed at promoting development and technological innovation in the production sectors for the purpose of generating and incorporating national technology into the production of goods and services.

Article 2. For the purposes set forth in Article 1, the implementation of some of the following activities shall be facilitated:

- a) Applied research and experimental development, with a view to obtaining, adapting, improving, or assimilating production and management technologies;
- b) Basic engineering and detail activities, prototype design, experimentation in pilot plants, implementation and optimization of processes;
- c) Programs to strengthen companies' capacities for research and development and production, including the training of personnel for the introduction of new technologies and improved productivity and quality, the establishment of quality control systems, and research on the status of national and international technological and economic trends, in particular those of interest to the regional economies;

d) Technical assistance or technology transfer by entities in the national scientific-technological system.

The National Executive Body shall be authorized to introduce modifications in the list of promoted activities set forth herein, to the extent that said modifications adhere to the objective described in Article 1, and on the basis of recommendations made by the Secretariat of Science and Technology (SECYT).

Article 3. The following persons may be beneficiaries of this law:

a) Physical persons domiciled in the country pursuant to Article 89 of the Civil Code;

b) Juristic persons, whether public or private, constituted or qualified to operate in the country pursuant to Argentine laws, and legally domiciled in national territory.

Article 4. The following persons may not be beneficiaries:

a) Physical and juristic persons whose representatives or directors have been convicted of any type of non-culpable crime, punishable by a prison sentence or disqualification throughout the term of the sentence;

b) Physical and juristic persons who at the time of receiving benefits have debts due and payable of a fiscal or contributational nature, or against whom a final judicial or administrative decision has been issued declaring said person delinquent in matters of customs, exchange, taxes, or benefit contributions and ordering said person to pay taxes, duties, fines, or surcharges, as long as said payment has not yet been made.

Any trial or summary proceeding pending with reference to the crimes or infractions referred to in the preceding paragraphs shall cause the immediate halt of the administrative process until the case is resolved or a final ruling is issued, if the enforcing authority so dictates, taking into consideration the seriousness of the imputed crime or infraction.

Article 5. For the purposes of obtaining benefits, one of the three methods listed below may be adopted for carrying out the promoted activities:

a) Contracting with university research entities or others authorized by the SECYT;

b) Signing joint venture agreements with university research entities or others authorized by the SECYT;

c) Executing projects within the activities set forth in Article 2.

In the case of the method described in paragraph b), the agreements shall provide for the research entity to participate in at least thirty percent (30%) of the total amount of the project, and shall require that the cost of the services rendered by the latter be paid for by the beneficiaries in the manner established in the respective agreement.

In the case of paragraph c), the entire project may be carried out by the beneficiary, provided that 1) the project obtains a favorable technical evaluation from a research and development entity designated by the SECYT pursuant to the provisions of this law; 2) the beneficiary agrees to a technical audit of the project by one of the entities mentioned in the previous point, with remuneration; and 3) the beneficiary agrees to a financial audit by an entity that is remunerated for that purpose, pursuant to regulations.

The research entities shall be registered on the list maintained by the SECYT for that purpose.

In accordance with the fiscal allocation referred to in Article 19 of this law, preference will be given to projects in which university research entities participate.

Article 6. To receive benefits, the research projects formalized by the methods listed in the previous article must first be approved by the SECYT in accordance with the form, terms, conditions, and requirements set forth in this law and its other regulations.

Article 7. The promotional benefits shall consist of the granting of tax credit certificates, to be used for the payment of the beneficiary's fiscal obligations arising out of the taxes on profits, capital, net assets, and value added, or any taxes which replace or complement them.

Article 8. The tax credit certificates shall be issued for a fixed amount per project, and shall be nominative and non-transferable.

Article 9. The tax credit certificates shall be delivered within sixty (60) days after the documentation is submitted, in accordance with the methods and frequencies established by the enforcing authority.

Article 10. The aforementioned certificates shall be used for the payment of the fiscal obligations for the taxes referred to in Article 6 within two (2) years of the date of delivery.

Article 11. The tax credit certificates referred to in this law shall not be subject to any national tax, present or future. Furthermore, the provisions of Article 80 of the Profits Tax Law (text codified in 1986) shall not apply to the respective amounts.

When the beneficiary is a local company with foreign capital, the incorporation of the aforementioned certificates into the company's assets shall be subject to the profits tax to the extent that it results in a transfer of income to the treasuries of foreign governments.

Article 12. For the purposes of obtaining the tax credit certificate, expenditures disbursed for the execution of the projects shall be updated from the antepenultimate month when they were carried out until the antepenultimate month when the application for the tax credit certificate is submitted. Said

updating shall be based on the changes in the wholesale price index, general level, which is furnished by the National Institute of Statistics and Census (INDEC).

Article 13. The benefit to be granted shall amount to sixty percent (60%) of the total cost of the approved project. If the promoted projects should lead to the attainment of patents or other rights, the respective contracts shall establish the share of ownership and usage rights that corresponds to the research entities that participated.

In the case of pacts with research entities of national universities, the royalties obtained from licensing or granting patents to third parties shall be used to establish a special research fund for the respective university. Said funds shall not be used for any purpose other than scientific and technological research.

Article 14. For the purpose outlined in the first paragraph of the preceding article, the total cost of the project shall not be higher than the cost approved by the SECYT at the time of submittal, plus the necessary updating of amounts between the month prior to the aforementioned date and the month prior to the finalization of the project.

Article 15. The technicians, instructors, and researchers of public institutions participating in the pacts provided for in Article 5 of this law may earn a monetary emolument under the system established by the National Executive Body (PEN). The funds received by virtue of the respective pact shall be used for this purpose.

Article 16. The Secretariat of Science and Technology of the Ministry of Education and Justice shall serve as the enforcing authority of this law, with intervention by other entities or agencies of the state for jurisdictional considerations set forth by the Ministries Law or special legislation.

Article 17. In each case submitted for its approval, the SECYT shall determine the nature of the expenditures that shall justify the granting of the certificate. For the purposes of approving projects, the enforcing authority shall consider the following criteria:

- a) The degree of priority that has been assigned to the goods and services involved in the project, pursuant to the country's development policy;
- b) Whether the applying companies are small or medium-sized;
- c) The degree of technological and commercial risk involved in the projects;
- d) The contribution to the regional economies and to the promotion of exports.

Article 18. In each project, the SECYT shall estimate the theoretical fiscal cost that will arise out of the application of Article 7 for each year when the promotional system is in force, until the term of benefits expires. It shall so inform the Finance Secretariat for analysis and allocation purposes.

Article 19. The Economy Ministry shall determine an overall allocation each year, based on the proposals from the Secretariats of Science and Technology and Finance. Said allocation shall be included in the Budget Law, and shall constitute the limit within which projects may be approved and charged against such allocation.

For these purposes, the theoretical fiscal cost of each project attributable to the budget year in which it is allocated shall be the amount of the tax credit certificates expected to be granted during that year, and in no case shall it be less than the figure obtained by averaging the overall fiscal cost of the project over the years of the benefit term, beginning with the implementation of the project. Projects may not receive final approval until the respective theoretical fiscal cost is allocated by the Finance Secretariat. For this purpose, a term of thirty (30) days shall be granted for filing objections. At the end of such term, the enforcing authority shall proceed to approve the project in question.

Article 20. For the purposes of determining the overall allocation referred to in Article 19 of this law, the fiscal cost arising out of projects approved in previous budget years shall be taken into account.

Article 21. The enforcing authority shall inform the Finance Secretariat within the first ten (10) working days of each month of the total number of tax credit certificates actually issued during the immediately preceding month, specifying the beneficiaries and the amounts.

Article 22. The enforcing authority shall have broad powers to verify and evaluate the beneficiaries' compliance with their obligations under the system established by the law.

Article 23. Failure by the beneficiaries to comply with the provisions of this law and the obligations arising out of the act of granting benefits shall result in the imposition of the following measures, at the discretion of the enforcing authority:

- a) In the case of strictly formal non-compliance, a fine of up to one percent (1%) of the updated amount of the project;
- b) In the case of non-compliance not included in the preceding paragraph:
 - 1) When certificates are not used for the payment of taxes, they shall be returned;
 - 2) If the certificates have been used, collection must be made of the updated amount, based on changes in the wholesale price index, general level, furnished by the INDEC, from the month immediately prior to the date of delivery of the certificates until the month immediately prior to the month when the beneficiary is declared in default on the contractual clauses and the benefits are forfeited, plus the interest established for this type of updated amount by Article 42 of Law No. 11,683 (text codified in 1978, and amendments).

Article 24. The non-compliance measures set forth in this law shall be imposed following the procedure determined by the regulations. These measures may be appealed within ten (10) working days of the notification of said measures, before the National Federal Appeals Chamber in the Federal Capital, Executive Appeals Department, or the appropriate administrative remedies may be pursued first.

The judicial collection of the fines imposed shall be carried out through the attachment procedure, and for this purpose, once the final decision has been issued, the SECYT shall proceed to issue the corresponding indebtedness document, which shall constitute good cause for such collection.

Article 25. The regulations for the enforcement of this law shall be completed within ninety (90) days.

Article 26. For the purpose of obtaining benefits, projects shall be submitted to the SECYT no later than 31 December 1995.

Article 27. The National Executive Body is hereby informed of this law.

8926

CSO: 3699/75

ARGENTINE BANK TO FINANCE MILITARY S&T PROJECTS

Buenos Aires ARGENTINA TECNOLOGICA in Spanish May 87 p 45

[Excerpt] The Bank of the Province of Buenos Aires recently signed complementary agreements with the Armed Forces Scientific and Technical Research Center (CITEFA), the Research and Development Program of the Bahia Blanca Petrochemical Complex (PIDCOP), and the the National Institute of Agricultural-Livestock Technology (INTA), for the purpose of supporting development and technological innovation programs.

In all agreements, the Bank gives preference to the financing of projects submitted by private sector firms located in the province of Buenos Aires, with the sponsorship of each of the signatory entities. The financing of the projects is determined at the sole discretion of the Buenos Aires credit institution, and financing is granted to the applicant firm. The scientific and research entities, for their part, provide consultation on the evaluation of the companies' technological proposals, advising whether or not they are of interest and fall within the established guidelines for gaining promotional access to the financing or services granted by the Bank through the Professor Jorge Alberto Sabato Office of Development and Technology. In addition, these entities, at the request of the credit institution, help oversee the use of the funds for the specified purposes, verifying that the funds are spent as planned on research and development.

Present at the signing ceremony were the president of the Bank of the Province, Dr Aldo Ferrer; the president of CITEFA, Brig Gen Hector Eduardo Ruiz; the chief of the Research and Development Program of the Bahia Blanca Petrochemical Complex, Numa J. Capiati; and the president of the INTA, Carlos A. Lopez Saubidet, as well as representatives of the scientific community and the private sector. Here is the text of the agreements concluded with each of the aforementioned institutions.

Complementary Agreement with CITEFA

In the city of Buenos Aires, this nineteenth day of the month of March in the year 1987, the Armed Forces Scientific and Technical Research Center (hereinafter known as CITEFA), represented on this occasion by its president, Brig Gen Hector Eduardo Ruiz, or whoever may legally replace him, as the party of the first part; and the Bank of the Province of Buenos Aires (hereinafter

known as the Bank), represented on this occasion by its president, Dr Aldo Ferrer, or whoever may legally replace him, as the party of the second part, do hereby agree on the present cooperation pact governing the efforts of the Bank of the Province of Buenos Aires and CITEFA in the area of technological development, emphasizing the broad spirit of cooperation that inspires their respective institutions and the need for the scientific-technological sector to complement the production sector. For these purposes, they agree as follows:

First: The Bank shall give preference to financing the development and/or technological innovation projects that are submitted to it by private sector companies located in the province of Buenos Aires, sponsored by CITEFA in the form of the participation of its laboratories and research centers in the respective research and development processes.

Second: The financing of the projects shall be determined by the Bank at its sole discretion, and shall be granted to the applicant company independently of the contractual relationship between the latter and CITEFA, in which the Bank shall have no involvement.

Third: CITEFA shall provide consultation by means of the reports and opinions that are necessary for the Bank to evaluate whether or not the technological proposals of the companies are of interest and fit within the guidelines established by the Bank for promotional access to the bank financing or services it provides through its Professor Jorge Alberto Sabato Office of Development and Technology.

Fourth: CITEFA shall, at the request of the Bank, help oversee the utilization of funds for the specific purposes for which they are granted, verifying the progress of the research and development processes called for in the project.

Fifth: CITEFA may offer the private businesses of the production sector located in the province of Buenos Aires, in addition to its research and development services, the possibility of obtaining financing from the Bank on the terms set forth in this agreement.

Sixth: In order to implement this agreement, a Coordinating Committee shall be formed, consisting of one titular member and one alternate member for each of the signatory institutions.

Seventh: This agreement shall have a term of 2 years, running from the date it is signed. It may be renewed by mutual agreement of the parties upon its expiration. In addition, either of the parties may rescind this agreement by notifying the other party in writing not less than 30 days before the date upon which it is scheduled to expire. In the case of rescission, the parties agree to continue all activities that are underway until they are completed.

Eighth: The intervention of the parties pursuant to this agreement shall not result in any form of remuneration being paid to either of them.

Ninth: This agreement is hereby signed in two copies, each with the same meaning and effect. The following domiciles are hereby established: For CITEFA, Zufriategui 4380, Villa Martelli, Province of Buenos Aires; for the Bank of the Province of Buenos Aires, San Martin 137, Federal Capital.

8926

CSO: 3699/75

BRAZIL , FRG TO COOPERATE IN S&T

Rio de Janeiro O GLOBO in Portuguese 28 Apr 87 p 27

[Text] The technological cooperation between Germany and Brazil in the field of communications, satellites in particular, and in the construction of large-sized computers, as well as the continuation of the nuclear program, covers the three areas which should have the largest amount of technology transfer from that country to Brazil over the next few years. This statement was made yesterday by the West German consul general in Rio de Janeiro, Hans Joachim Dunker, during the seminar entitled "Brazil-Germany: Cooperation for Technological Innovation," held by the consulate and the Rio State Federation of Industries (FIRJAN), in the SENAI [National Service for Industrial Apprenticeship] auditorium.

Hans Joachim Dunker noted, however, that German small and medium-sized companies might also make contributions with Brazil in the area of technological cooperation. One instance of this was mentioned during the seminar, in the lecture given by the manager associate of Wirtschaftliche Verbrennungstechnik GmbH, Karl Wilhelm Prochnow, who discussed biogas as a fuel.

The German consul explained that, in his country, small and medium-sized business firms receive incentives from the government for the development of technological research, and that last year alone, a billion marks was allocated for projects of those companies. In addition, they receive tax incentives, and the government also encourages scientists to form their own companies to carry out their projects, aiding them with risk capital applied for a period of from 1 to 2 years.

The head of the Brazil-German Chamber of Commerce and Industry, Walter Haagen, explained that the technological cooperation between the two countries to date has occurred only through courses, government agreements, and business contracts. In the latter area, the transfer of German technology to Brazil has benefited primarily the machine, metal, and transportation equipment industries. However, he disclosed that Brazil has also contributed to German technology, improving certain techniques and inventing others, such as the technology for processing phosphatic rock, completely developed in Brazil.

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